Dr. Kelly Tiller

-Genera Energy

-President & CEO-

Growing a Future of Clean Renewable Energy

Building a Biofuels Industry in Tennessee

Tennessee Alternative Fuels & Bioenergy Conference
Montgomery Bell State Park
August 16, 2010

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Tennessee's Comprehensive Approach

BIOFUELS INITIATIVE

Energy Crop Supply Chain

Demonstrate the establishment of a dedicated biomass energy crop supply chain with farmer

AgResearch Extension

Biofuels, Bioproducts R&D

Establish premier RD&D capabilities and capacity in biofuels and bioproducts

BESC BioEnergy Science Center · SunGrant INITIATIVE · Oak Ridge National Laboratory

Commercialization

Develop a viable, sustainable, long-term path to commercialization of cellulosic biofuels in Tennessee

Genera energy

$70.5 Million
State Commitment

Cellulosic Ethanol Biorefinery

Demonstrate the pre-commercial production of ethanol from switchgrass

DDCE DuPont Danisco Cellulosic Ethanol LLC · Genera energy

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Switchgrass as an Energy Crop

- Well suited to the Southeast
  - — Currently, ~6-10 tons/acre in TN
  - — Potential for 12+ tons/acre
- Warm season, native, perennial grass
- Tolerates poor soils, flooding, drought
- Highly resistant to many pests, diseases
  - — Low use of chemicals or fertilizers
- 1-2 year establishment
  - — Weed control critical in establishment
- Works with existing infrastructure
- May be removed, improves soil quality
- UT research focus for 20+ years

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Tennessee Switchgrass Experience

- Contracting with local farmers to produce 6,000 acres of switchgrass
  - Nearly 3,000 acres harvested in 2009
  - Added >3,000 acres in 2010
  - 1,000 acres improved varieties
- UT/Genera contract with local farmers
  - ~$450/ac/yr for 3 years
  - We provide seed, technical expertise
  - Separate storage contracts
  - Yield-based component in 2010
- Averaging about 8 tons/ac by 3rd year
  - Harvesting ~2 tons in year 1
  - ~5 tons in year 2
  - ~8 tons year 3 and beyond

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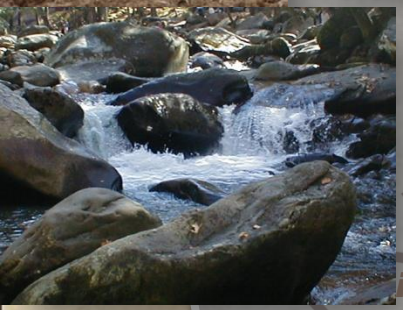
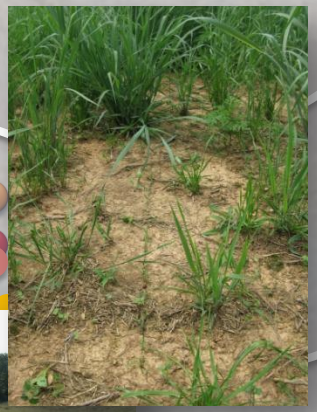
Switchgrass Contract Farms












Roane

Lou

Biore

Vonore

75

McMinn

Polk

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- 2008 SFIP Contract
- 2009 SFIP Contract
- 2010 SFIP Contract

Preliminary, as of 5/21/10

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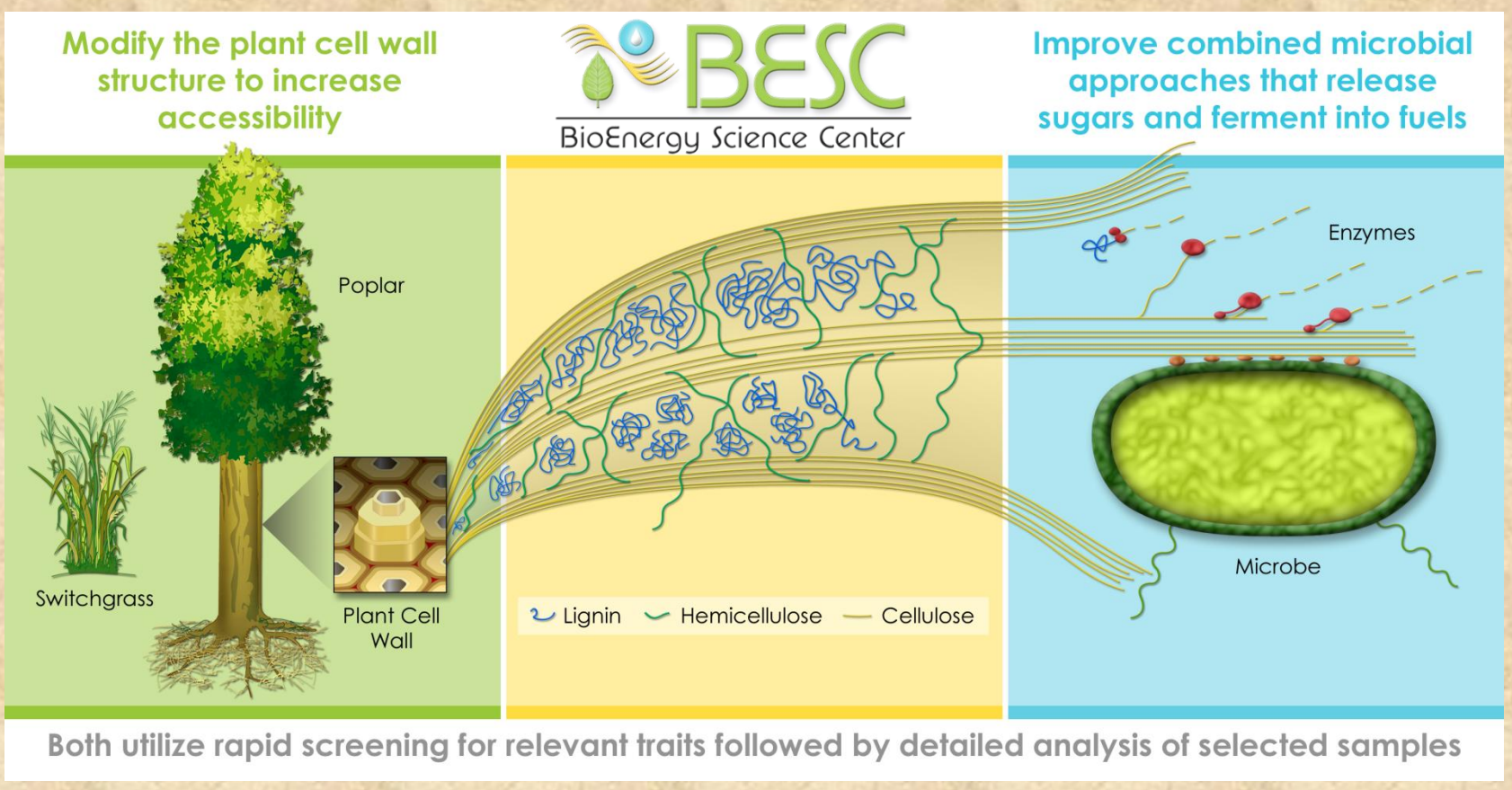
ORNL-BESC Research Focus



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UT-CRC Research Focus

CRC
Center for Renewable Carbon

- Coordinate R&D in renewable carbon systems
- Create new conversion technology
- Support technology demonstrations
- Educate and train the new workforce
- Transfer science and technology to a broad client base

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Cellulosic Ethanol Biorefinery

- Collaboration between Genera Energy and DuPont Danisco (DDCE)
- Vonore, Tennessee: Niles Ferry Industrial Park, Monroe County, 32 acre site
- 250,000 GPY demo plant and Process Development Unit (PDU) pilot plant
- Optimized as precursor to commercial facility
- Started operations December 2009
- Multiple feedstocks: cob & switchgrass
- Long-term operation as an RD&D facility

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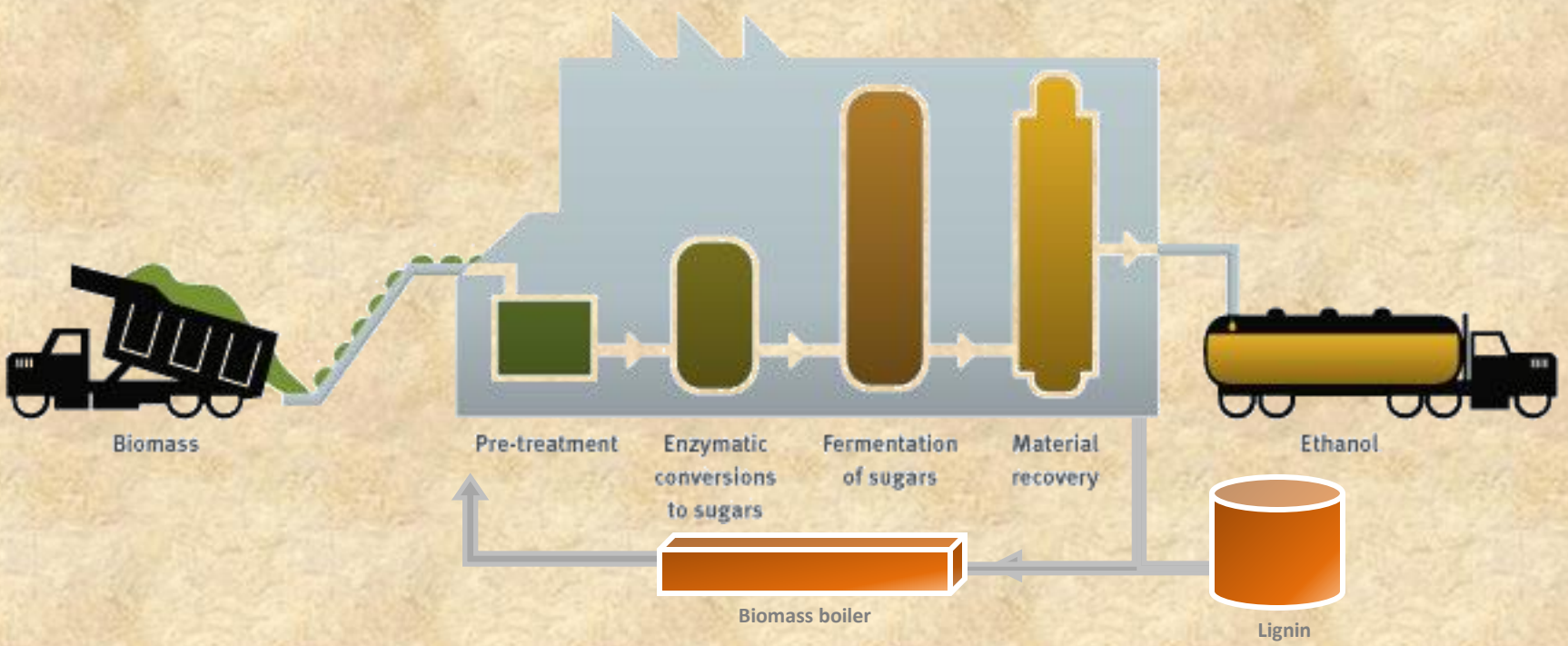
DDCE Proprietary Conversion Technology



- Pre-processed (chopped & milled) biomass arrives at the biorefinery
- DuPont-developed pre-treatment technology opens the polymers for greater enzyme access
- During enzymatic hydrolysis (or saccharification), Genencor-developed enzymes break down cellulose and hemicellulose into component sugars
- DuPont-developed fermentation technology converts sugars to alcohol
- Alcohol is distilled into fuel-grade ethanol & co-products are recovered
- Lignin can be burned for energy or used for other chemical and material products

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Super Sacks of Cob in Warehouse

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Pretreatment

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Saccharification & Fermentation

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Saccharification Tanks

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Distillation Columns

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Lignin Filter Press

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Evaporation & Separation

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CIP / Recycle

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World Class Lab Facilities

Training a New Industry Workforce

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Technology Status: Key Metrics

	Initial May 2008	Status Nov 2009	Commercial Target (2012)
SELECT INPUT VARIABLES			
Enzyme Cost (% of original)	100%	50%	22%
CAPEX - 2008$ per Gal	$8+	$5 to $7	~$3 to $5
PROCESS RESULTS			
Total process yield - Gal/T	67	85	90
Ethanol Titer - g/L	63	82	90
COM - $/Gal	~ $3.00	<$2.00	$1.50

Source: DDCE presentation at DOE Biomass 2010, 3/30/10

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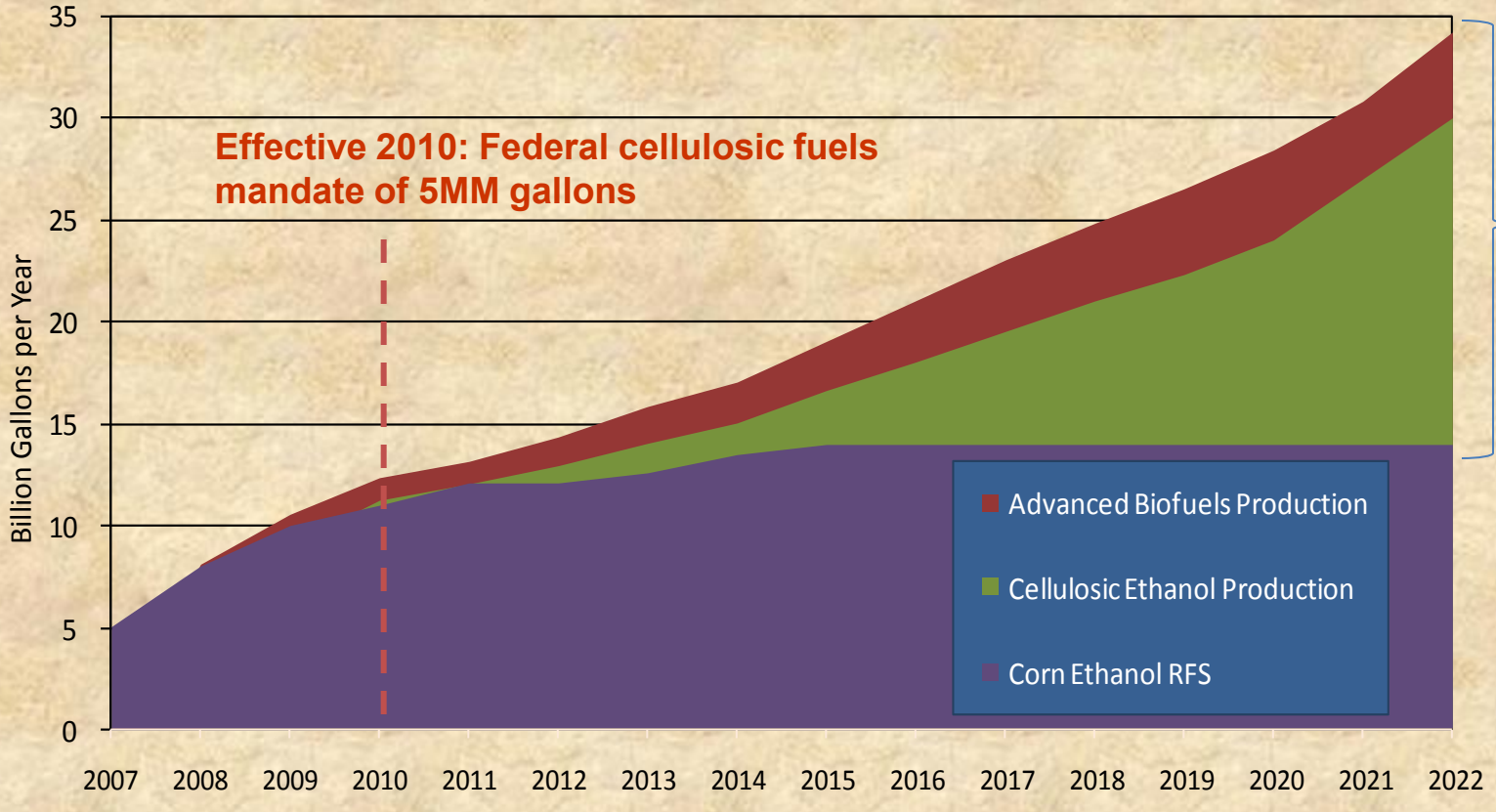
Expanded Renewable Fuels Mandate



60% of biofuels non-corn, 16 BGY cellulosic

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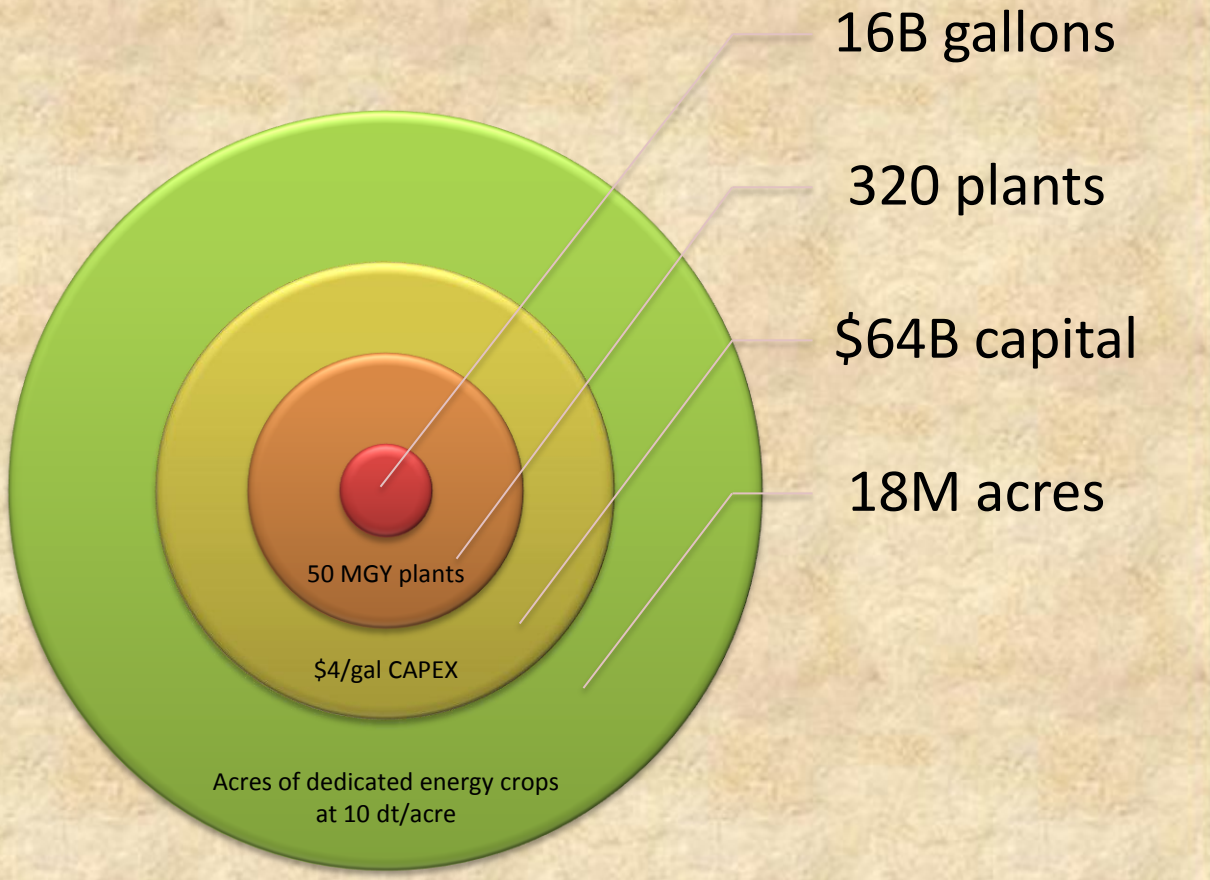
RFS2 Requires Aggressive Buildout

- Average 40 new construction starts per year by 2012
- 300+ plants likely operated on dedicated energy crops or SRWC
- Requires > 2M acres/yr **NEW** energy crops beginning 2011



Meeting the 2022 RFS for Cellulosic Ethanol

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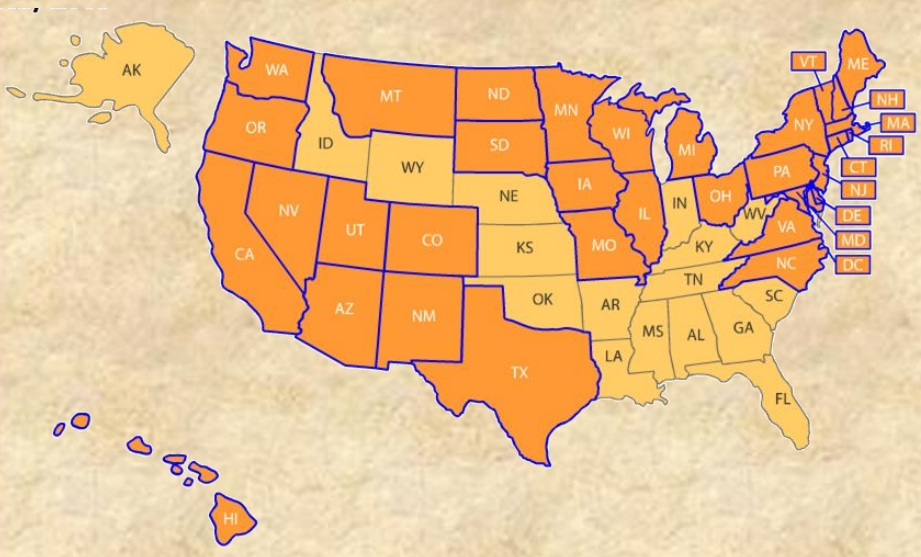
Mandates for Renewable Electricity



Southeast has the biggest hurdle for compliance

…

Biomass will be a key solution for the Southeast

- Currently have a patchwork of state mandates
  - Most have passed since 2004
  - Ranges from 8% by 2020 (Penn.) to 40% by 2017 (Maine)
  - Wide range of approaches
- Disproportionate effect on Southeast
  - Heavily dependent upon coal
  - Most economical way to meet is with wind, geothermal, some solar … not an option for SE
- Federal mandate expected

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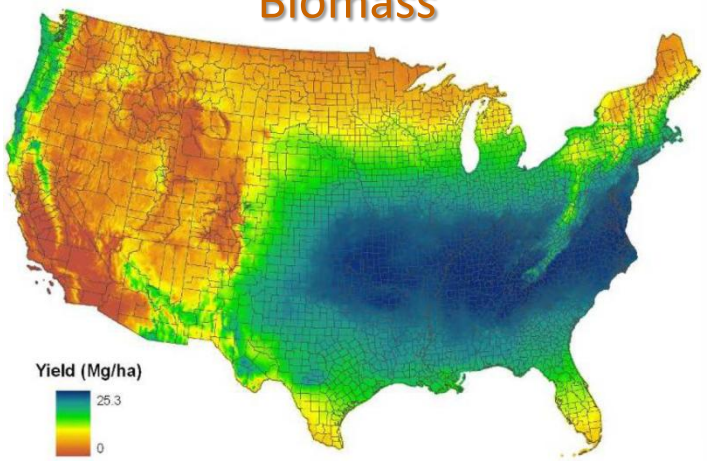
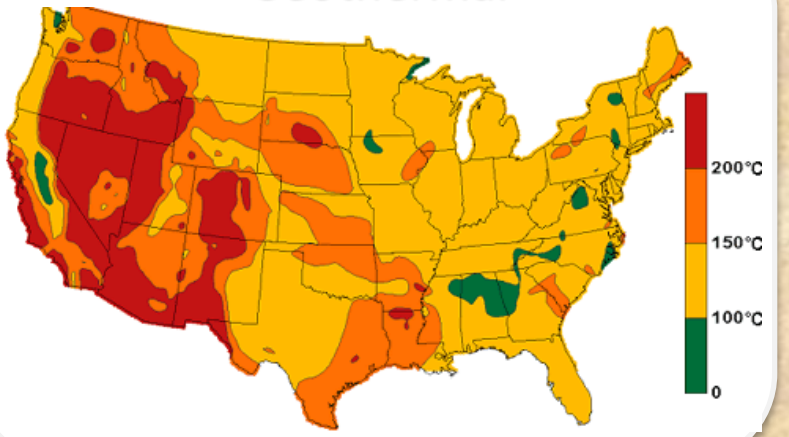
Renewable Energy Options

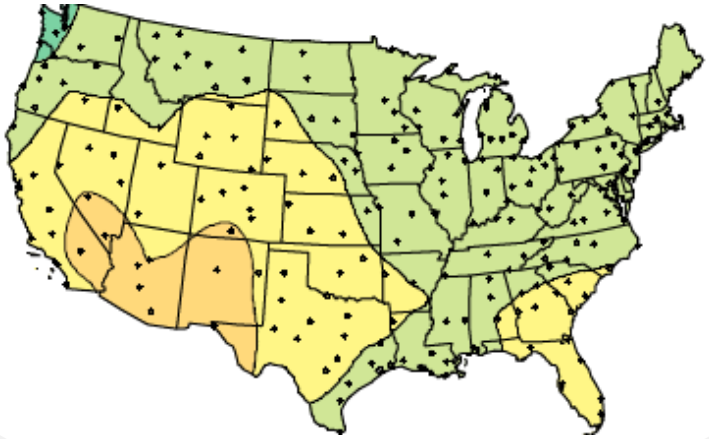
Biomass



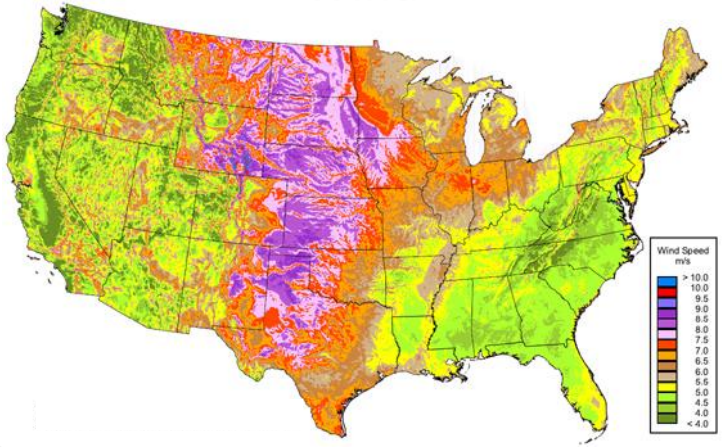
Geothermal



Solar (PV)



Wind



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The Opportunity: Integrated Supply Solutions

Integrated, efficient biomass supply chains
… spanning from the farm to the processor's gate …
are the foundation for all pathways and processes to create
biofuels, biochemicals, bioproducts, biomaterials, biopower, and bioenergy

Biomass Feedstocks

Biomass Logistics

Biomass Pre-Processing

Biomass Conversion

Product Logistics

End Use

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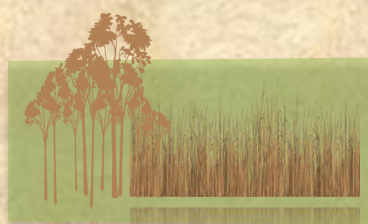
Integrated Biomass Supply Chain



Biomass Production & Harvest

Handling, Storage, Transportation

Pre-Processing & Densification

Value-Added Pre-Treatment

Industrial Processing

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Biomass Production & Harvesting

- Crop genetics
- Improved establishment
- Technical expertise
- Tailored equipment
- Seed availability
- Risk management

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Building Energy Crop Seed Capacity

Genera
energy crops

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Biomass Handling, Storage & Transporation

- Year-round supply
- Minimize handling
- Maximize bulk handling
- Minimize storage loss
- Maintain quality
- Manage moisture
- Increase bulk density

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Biomass Pre-Processing

- Particle size – coarse chop to flour
- Conveyance & flowability
- Energy intensity
- New systems, systems integration
- Multiple feedstocks
- Packaging & transportation

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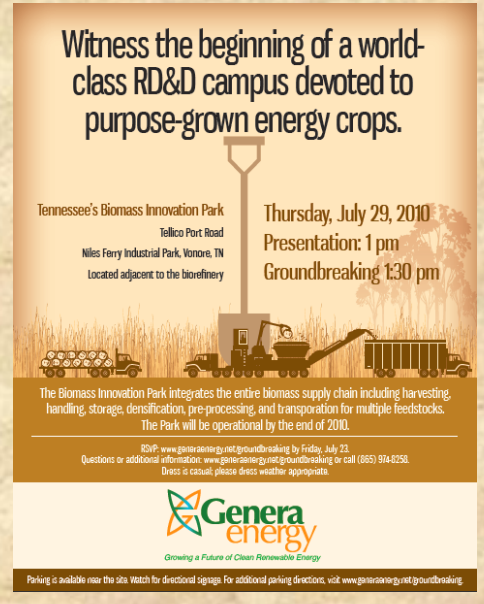
Biomass Innovation Park Groundbreaking



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Tennessee Biomass Innovation Park

- World-class RD&D campus
- Integrates entire biomass supply chain
  - Harvest, handling, storage, densification, logistics
  - Pre-processing
  - High throughput screening and analysis
  - Agronomics, plant genetics, production
  - Intermediate processing and conversion
- Multiple feedstocks
- Site for $5M DOE-funded high tonnage bulk handling demonstration
- Operational by end of 2010
- Strategic partnership opportunities
- Template for regional biomass depots

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Biomass Innovation Park Timeline

2010

- Phase I to be completed by the end of 2010, incorporates $5M DOE grant to demonstrate high-tonnage switchgrass bulk handling system

2011

- Working with switchgrass-to-hydrogen technology partner to demonstrate pre-commercial scale unit for power generation
- Potential to develop/demonstrate integration of novel pretreatment

2012

- Seeking grant funding (with UT) to add biomass characterization and analytical laboratories
- Potential to expand footprint to demonstrate gasification, pyrolysis, other conversion technologies or feedstocks

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Building Investment Capacity

Genera capital

- Enhance the availability of Venture Capital in the region to maximize the results of the tremendous increase in research funding
- Leverage State and Federal investments
- Leverage national leadership available locally in bioenergy project development
- Utilize the assets of UTRF, UT and ORNL in the commercialization of discoveries
  - Initially in the energy space
  - Later, broader technology commercialization
- Four Fund initial approach
  - Fund I: Biomass Innovations I, LP
  - Fund 2: REIT
  - Fund 3: Clean Energy Fund
  - Fund 4: UTRF Commercialization Fund

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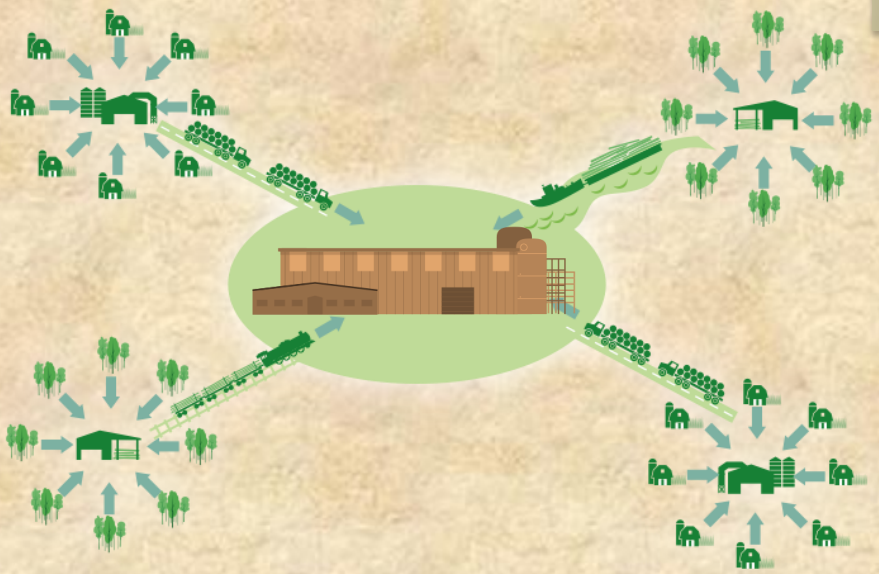
Depot Products for Downstream Conversion

Biomass Depot (hub and spoke) model for supplying, storing, and pre-processing biomass feedstock integrates well with Genera's



New Generation Processing Cooperative (federated cooperative model) for organizing and aggregating biomass and retaining value closer to the farm gate

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Bioeconomy Challenges

2007

2010

- Proof of science
- Improving the economics
- Optimizing systems
- Environmental sustainability
- Developing protocols, regulations
- Consumer acceptance and use
- Consistent, sustained, supportive policy
- Access to capital
- Biomass feedstock focus

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Tennessee Leading by Example

www.GeneraEnergy.net

www.UTbioenergy.org

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Institute of Agriculture ◆ Office of Bioenergy Programs

Session 3:
Bio Based Economy

Bud Hughes

-Verdant Partners-

Opportunities for Crop Agriculture in a Bio Based Economy

Thomas F. Hughes, Verdant Partners LLC

T E N N E S S E E
Alternative Fuels & Bioenergy Conference

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Burns, Tennessee
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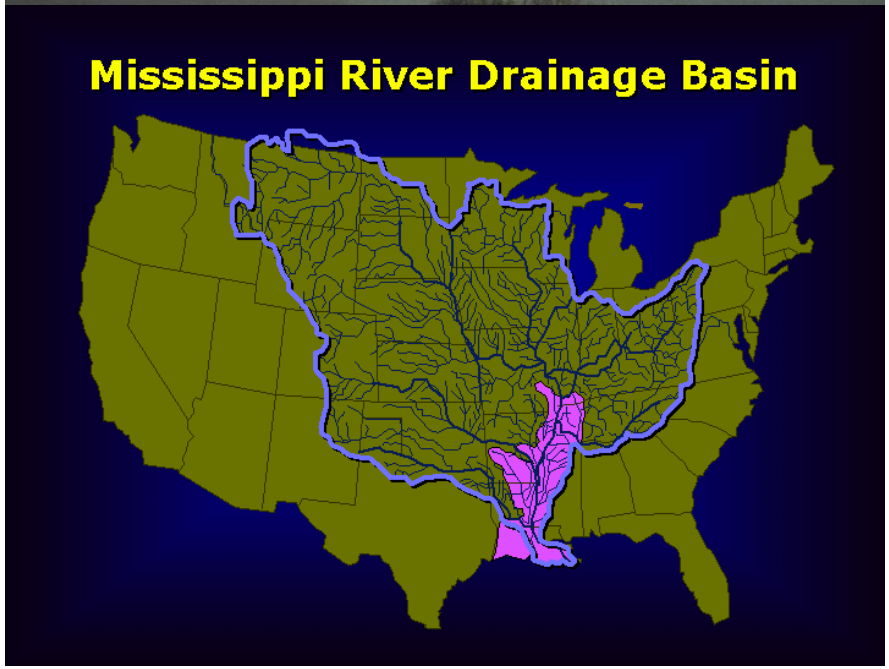
The Gift of the Mississippi River

- The Mississippi River watershed encompasses >40% of the continental United States
- Providing fresh water for a variety of uses, including agriculture
- Enabling efficient transportation logistics
- Creating rich farmlands & deep alluvial soils deposited over centuries



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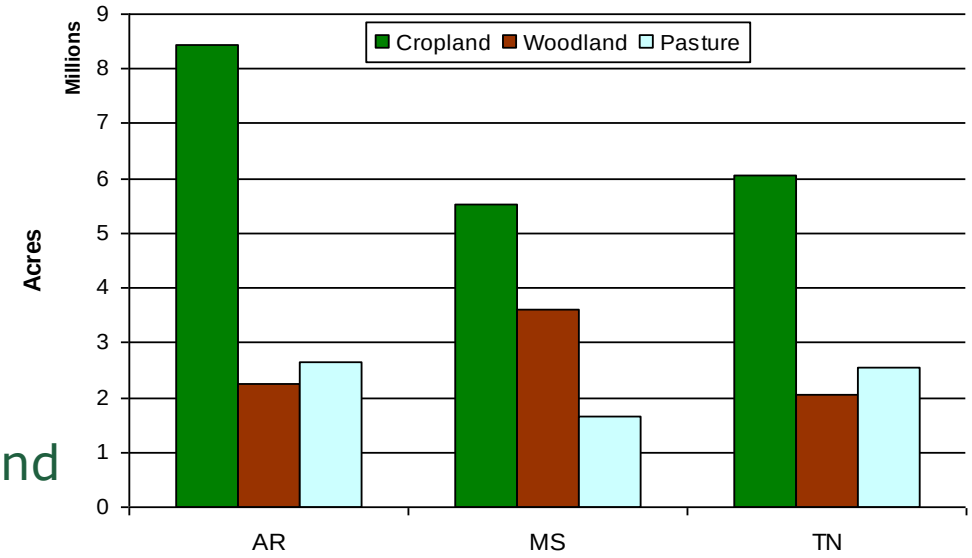
Regional Farmland Assets

- Farmlands are a regional asset (i.e. AR, MS, TN)
- Millions of acres of productive land
  - Large forests
  - Pastures for animals and wildlife
  - Wide array of Croplands
- All driving an economy based on farm-grown biological products



Source: USDA 2007 US Census of Agriculture

The Mid-South states of Arkansas, Mississippi and Tennessee combined offer approximately 8 million acres of woodlands, 7 million acres of pasture, and >20 million acres of cropland – ALL producing biobased plant materials

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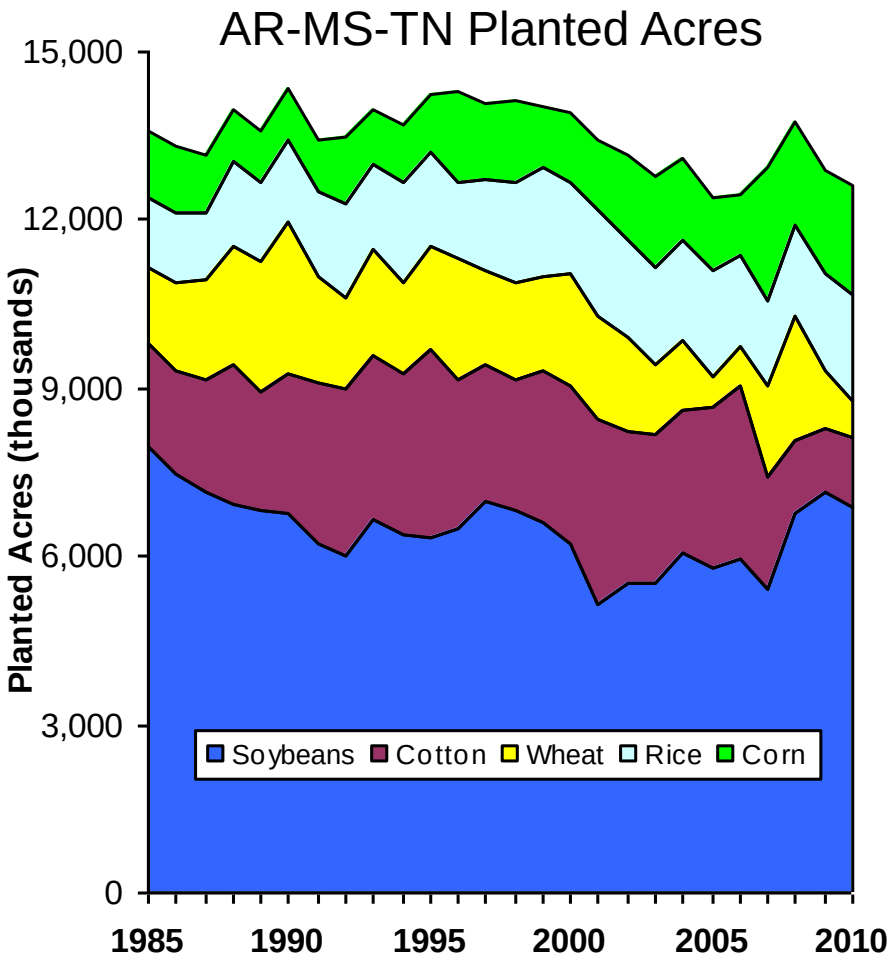
A Farm Production "Machine"

- Agriculture is our economic engine
- Powered by farmland
- Annual production of row crops, woodlands, & pasture based on
  - Productive soils
  - Abundant rainfall
  - Long growing seasons
  - Farming expertise
  - Market infrastructure
- Subject to annual supply & demand cycles



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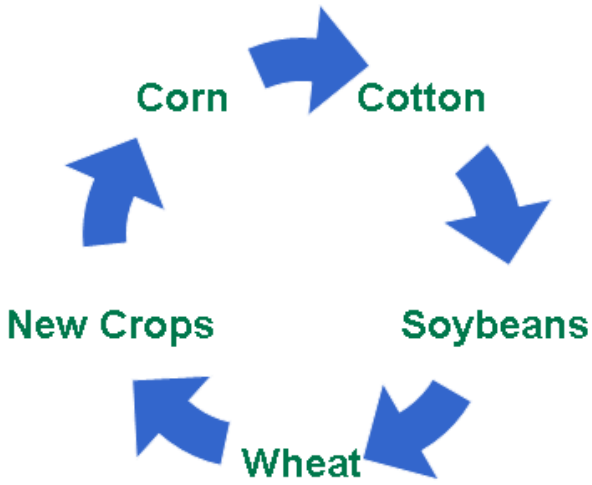
Crop Shifts – Southern Ag in Flux

- Crop plantings shift for a reason
  - Market price and value opportunities
  - Risk and cost management economics
  - Rotations to maintain productivity
  - New technologies adapted to add value or reduce costs



- "Biomass" crops now an alternative to standard food, feed & fiber crops
  - Non-food crops and crop residues
  - Switchgrass, canola, sweet sorghum, woody crops, miscanthus
  - Envisioned for fuels, energy, industrial chemicals, biomaterials
- Renewable feedstocks through sustainable production

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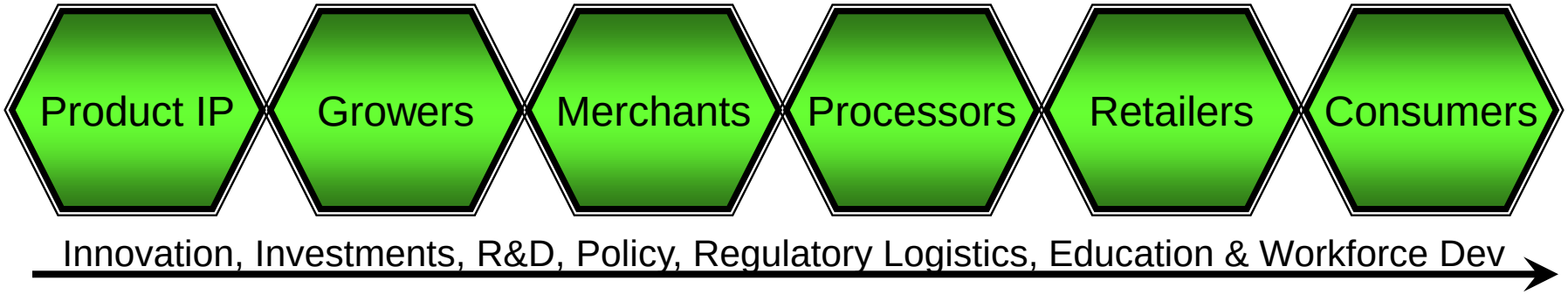
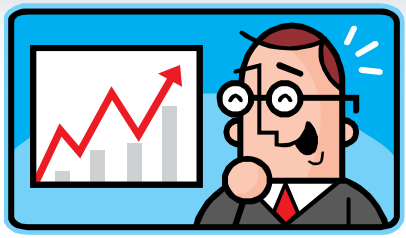
The Path to Market

- The "Old South" was based on King Cotton & included
  - Seed genetics & crop production technology
  - Farming infrastructure, education & know-how
  - Adaptable markets (price discovery & merchants)
  - Processing technologies (i.e. cotton gins, textile mills)
  - Consumer marketing & sales
  - Overlaid with logistics, workforce dev, regulation & Policy



- The "South of Tomorrow" will likely include a wider array of crops – each with similar market models

Bio Opportunities



Supply

- New markets for agriculture production
- Fulfill new & underutilized processing capacity
- Community jobs & economic engines

Demand

- Growers need sustainable, profitable crops
- Refineries want alternatives to petroleum
- Consumers demand "green" products
- National Security warrants food, energy & industrial products independence

We have the resources now

- The agricultural market is ready for change
- New use and conversion technologies evolving
- Consumers are ready
- Capital available for investments

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Bio Challenges

- Supply
  - Farm productivity learning curves
    - Breeding, biotech, education
  - Processing technology advances
    - Mechanical, chemical, biochemical
  - Logistics & distribution
- Demand
  - New crop market development
  - Co-products vs. by-products
  - Proven good for the consumer
- Network communications
  - Private, government, NGO, industry
- Policy, regulations, & political climates

New Crops – Who Moves First?

- **Breeders** can develop new genetics, but will there be a customer base for their products?
- **Growers** have resources to grow new crops; but will there be a market for their harvest?
- **Processors** can build capacity, but will there be a reliable supply of feedstocks?
- **Consumers** want products that make economic and environmental sense
- **Policy Makers** must use good science to regulate and enable alternatives
- **EVERYONE moves first** by communicating and work together toward common goals

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- **Consulting**
  - Strategic Business Plans
  - Crop Genetics market models
  - Financial Evaluations

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VERDANT PARTNERS™

Dr. Randy Powell

-BioDimensions-

Development of Sweet Sorghum as a Sugar and Energy Crop

Tennessee Alternative Fuels & Bioenergy Conference

August 16, 2010

Randy Powell

BioDimensions

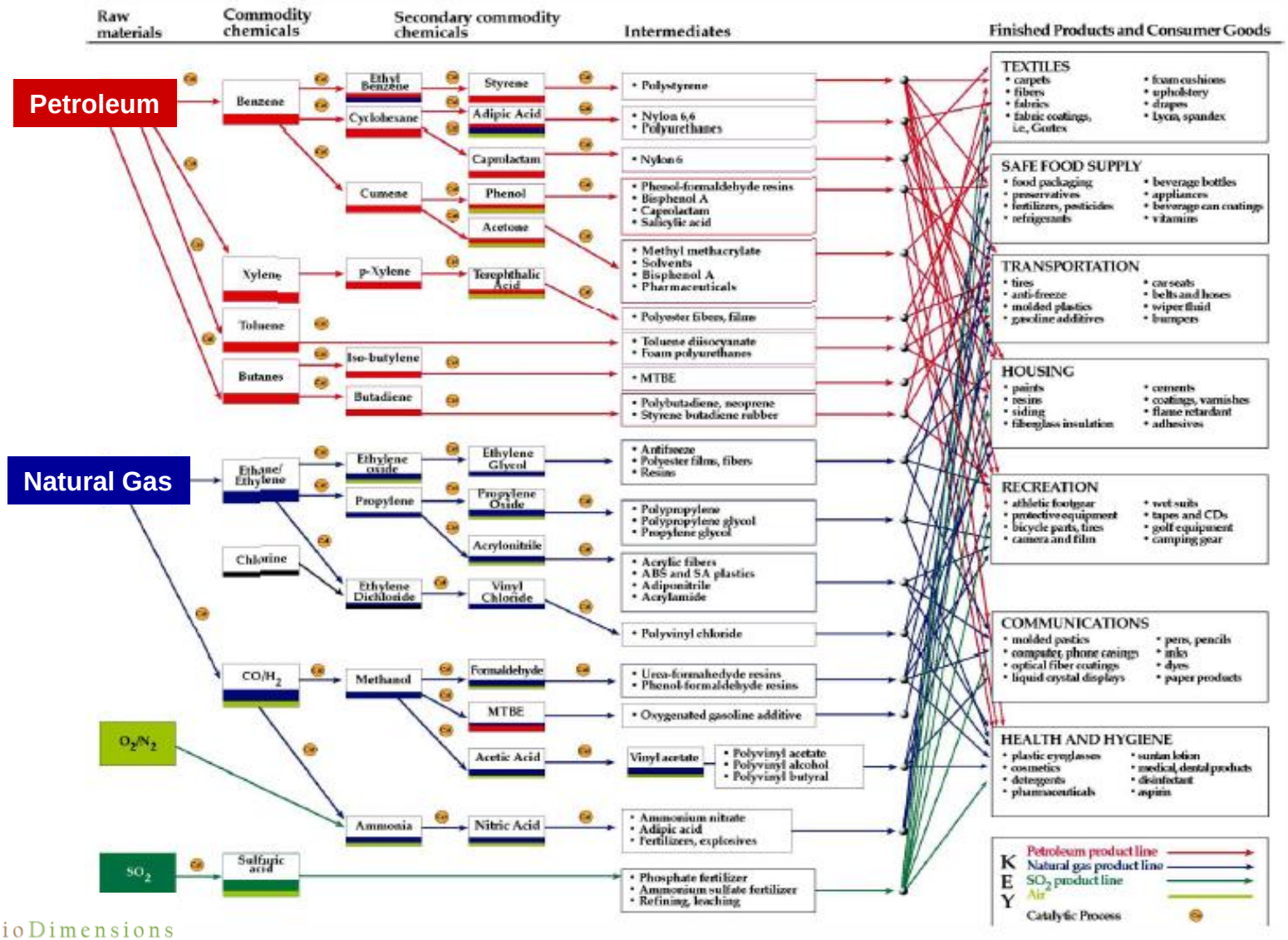
BioDimensions

BioDimensions is a Memphis-based consultancy and business development firm focused on crop diversity, facilitating farmer-owned processing, and the development of biobased products.

www.biodimensions.net

The Petrochemical Economy

Source: Top Value-Added Chemicals Report



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Cycle Times for Feedstock Renewal

Feedstock	Renewal time
Algae	1 month
Agricultural Crops	3 months – 1 year
Grasses	1 year
Shrubs	1-5 years
Trees	5-80+ years
Oil, gas, coal (Fossil)	**200 million years**

Source: Amidon, Tom, et al. *Industrial Biotechnology*, 2(2):113-120, 2006

All feedstocks derive from solar energy.
Fossil feedstocks are finite resources on a human timescale.

BioDimensions

What will replace Fossil Feedstocks?

Major Biomass Feedstocks		
Feedstock	Key Chemical Component(s)	Crop Examples
Oils	Plant oils: triglycerides	Soybeans, Canola, Sunflowers, Algae
Starch	Sugar polymers (polysaccharides)	Corn, Barley, Grain sorghum
Sugar	Sucrose, glucose, fructose	Sweet sorghum, sugar beets, sugar cane
Lignocellulose	Lignin, cellulose, hemicellulose	Wood, crop residues, switchgrass

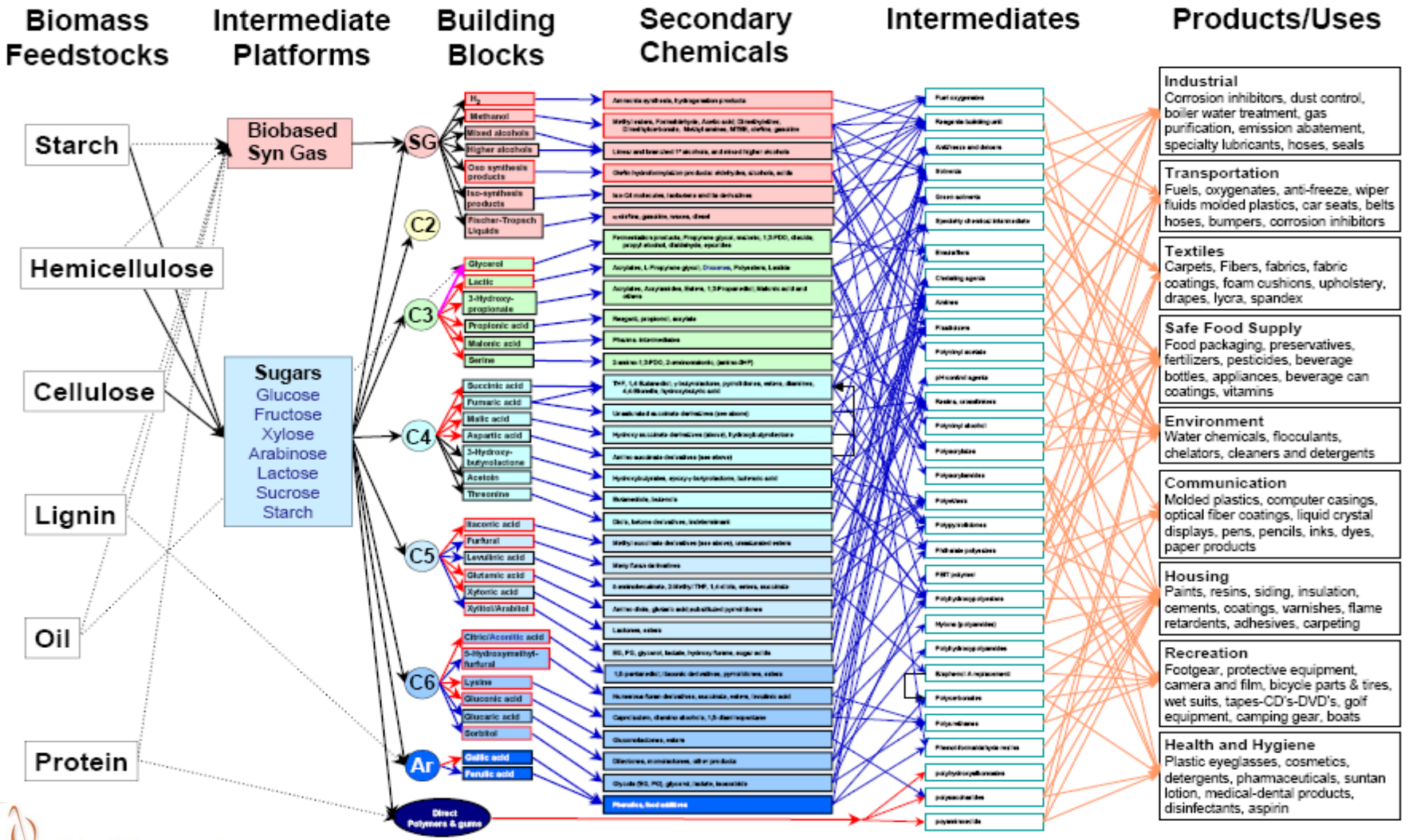
Source: *Regional Strategy for Biobased Products in the Mississippi Delta*, Battelle, 2009.

Our conclusion: Sugar is the "new oil."

BioDimensions

The (Carbohydrate) Bioeconomy

Source: Top Value-Added Chemicals Report



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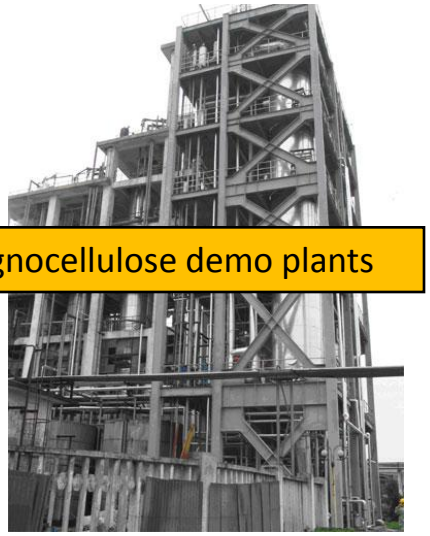
Regional Strategy for Biobased Products

Solid fuels for co-firing



Lignocellulose demo plants

<u>Four</u> recommended near-term bioprocessing opportunities for the region

New sugar crops and processing

New oilseeds & crushers

BioDimensions

New Sugar Crops for the mid-South Delta

BioDimensions is developing sweet sorghum & energy beets as sugar feedstock crops

- **Sweet Sorghum**
  - Year 2 of development program
  - New variety trials w/ 2 firms
  - Expanded processing trials
  - Product offtake agreements

6-8” Sorghum billets, October 2009

- **Energy Beets**
  - Multiple variety trials w/ 1 firm
  - 20 acre “commercial” plot for Fall 2010 processing trials

Whiteville, Tennessee; July 2010

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Key Issues for Sweet Sorghum Introduction

- Agronomic development
- Product and market development for industrial sugar
- Processing development & demonstration
  - Initially targeting decentralized rural processing facilities
  - “Hub and spoke” model for product consolidation

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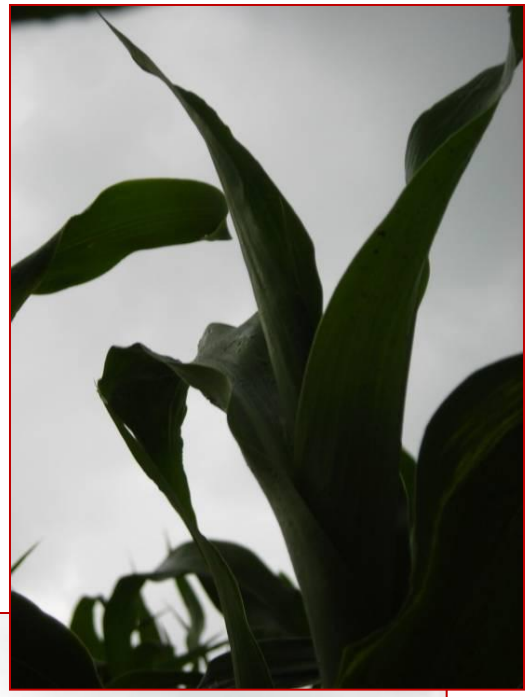
Sweet Sorghum Agronomic Development:

- An efficient C4 photosynthetic crop
- High yield potential (sugar, lignocellulose)
- Easy substitution in existing annual rotations
- Drought tolerant & low inputs
- Evaluating open pollinated and hybrid varieties
- Harvest flexibility with staggered planting
- Grain and sweet sorghum grown by region farmers for many years as a boutique crop



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Product & Market Development

- On-road fuel (anyhydrous ethanol)
  - Memphis is major fuel blending location (river, pipelines)
- Off-road fuel (hydrous ethanol, 95%)
  - Large Delta market for ethanol irrigation engines
- Industrial sugar feedstock
  - Chemicals by fermentation technologies
    - 1,3-PDO; Succinic acid; biobutanol; ethylene glycol
  - Much higher value than fuels
- Lignocellulose residues for feed, solid fuel, and hydrolysis sugars

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On-road Fuel Ethanol

Syrup evaluation at regional corn ethanol plants as alternative feedstock

New anhydrous ethanol plants

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Off-Road Fuel: Hydrous Ethanol Irrigation Engines

BioDimensions is developing hydrous ethanol (95%) as off-road fuel for the mid-South Delta with collaborator AmeriFuels (Kearny, Nebraska)

AmeriFuels hydrous ethanol engine currently in irrigation service at Weaver farm, Edmondson, AR. First mid-South installation.

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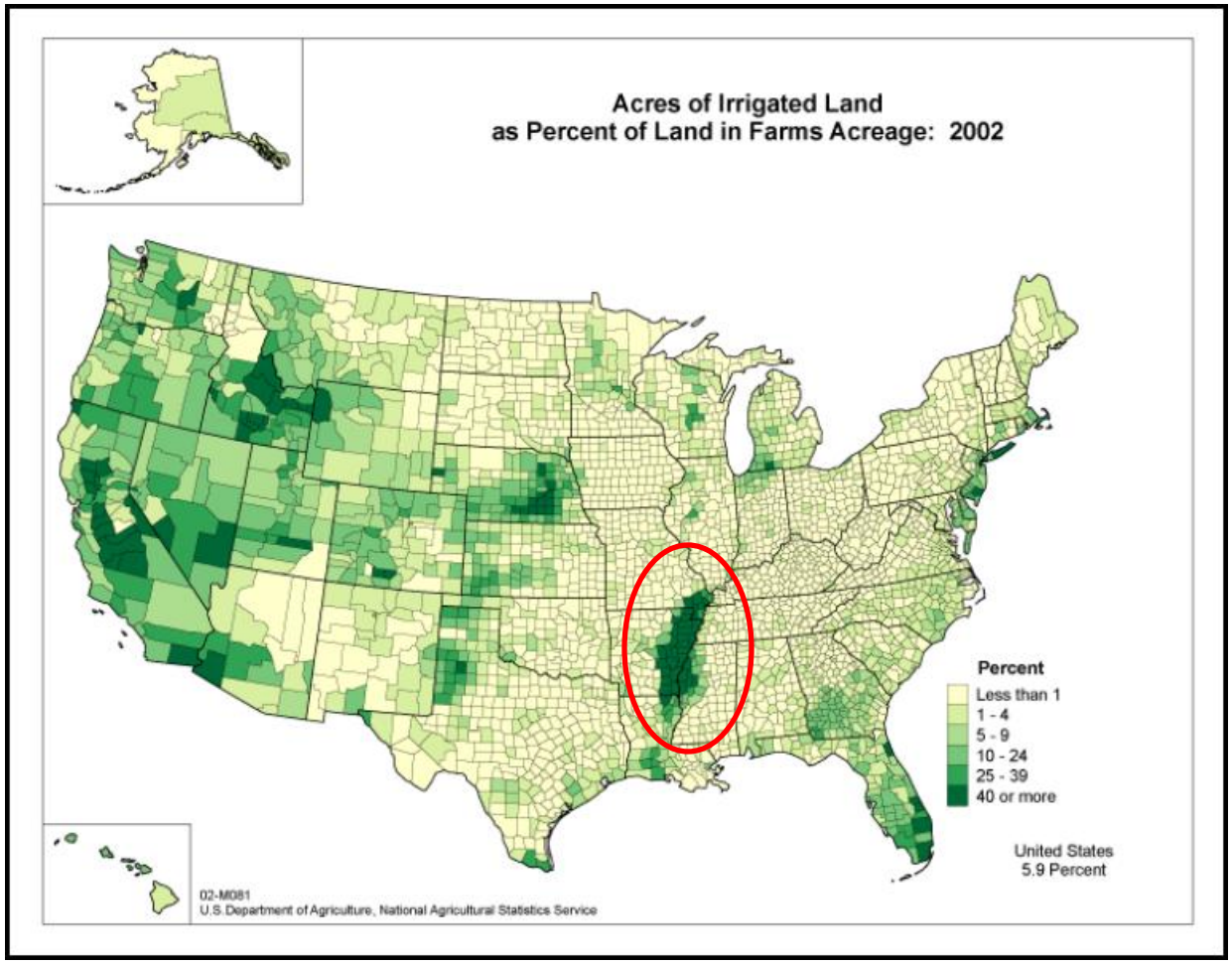
Irrigation Fuel Opportunity in the mid-South Delta



Over 114 million gal/yr hydrous ethanol demand potential for irrigation in AR, MO, MS, TN.
Potential for 228,000 acres sweet sorghum and/or energy beets at 500 gal/acre ethanol.

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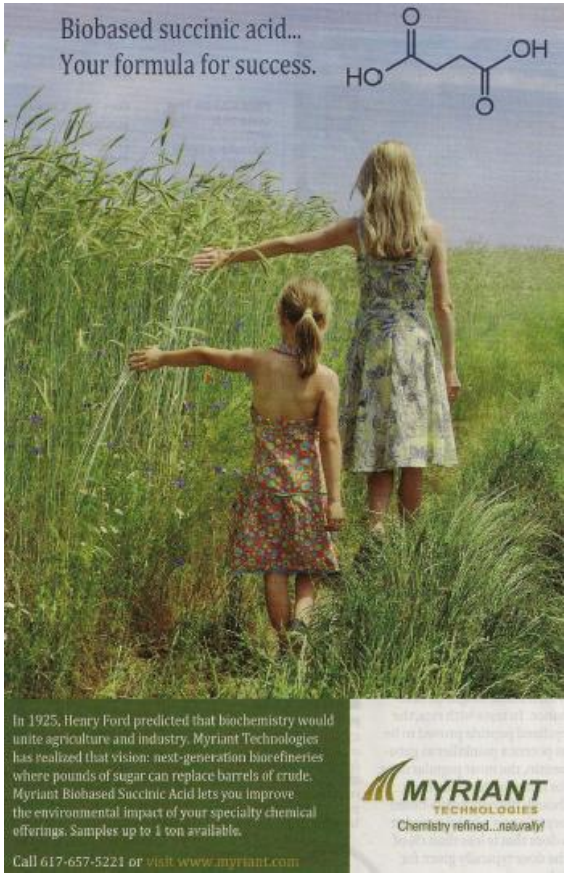
Industrial Sugar Feedstocks for Chemicals

New fermentation organisms are now emerging from R&D



COCA-COLA LAUNCHING BIOBASED BOTTLES

Coca-Cola says polyethylene terephthalate (PET) bottles incorporating sugar-derived raw materials are starting to hit store shelves. To make the plastic, the company is buying sugar and molasses from Brazil and having an undisclosed chemical firm convert these raw materials into ethylene glycol, which is polymerized with terephthalic acid to make PET (C&EN, May 25, page 9). The company is using the bottles in Denmark; will launch them in western Canada in December; and plans to test them in Los Angeles, San Francisco, and Seattle in January. Coca-Cola's aim is to make 2 billion of the bottles by the end of next year.—AHT

Genomatica produces 1,4-butanediol from sugar in fermentation tanks.

CHEMICALS STAR AT BIOTECH CONGRESS

INDUSTRIAL BIOTECHNOLOGY: Firms tout progress toward cost-competitive renewable chemicals

CHEMICALS, NOT FUELS, were the focus of many companies at the World Congress on Industrial Biotechnology & Bioprocessing, held last week outside Washington, D.C. As start-up firms search for elusive profits in industrial biotech, they are finding that making high-volume chemicals can be more lucrative than trying to compete with gasoline.

"Biofuels were really hot two or three years ago, but over the last few years, firms have come to realize that it is very difficult to make money just on fuel," observed Andrew L. Shafer, executive vice president for sales and marketing development at Elevance Renewable Sciences.

A specialty chemical start-up, Elevance uses olefin metathesis to make products from oils such as palm

BIOTECH CHEMICALS

Proponents of biobased intermediates get started on plans to **COMPETE WITH PETROLEUM**

MELODY VOITH, C&EN WASHINGTON

COMPANIES at the World Congress on Industrial Biotechnology & Bioprocessing, held in Washington, D.C., late last month, all claimed to have the formula for biobased success. More and more, that formula includes high-volume chemical products.

ize a new manufacturing process will be difficult at best.

"It's a tough time for companies that are trying to scale up and are looking for significant infusions of capital," said Damien Perriman, vice president of business development at biobased-chemical firm Ver-

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Lignocellulose residues for Feed & Fuel

Sweet sorghum bagasse

Sweet sorghum bagasse blending for bulk feed,
Rawhide Feeds, Whiteville, TN

Pellets contain 12% protein;
7356 BTU/lb; 6.63% ash.

Planning bagasse pellet feeding trials at two Universities and evaluating potential as fuel pellets.

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Sweet Sorghum Processing Development

Key Technologies for Commercial-Scale Biorefineries:

- Cost-effective and replicable mechanized harvest and juice extraction
- Demonstration of rural site juice concentration/stabilization
- Demonstration of rural site juice fermentation
- Demonstration of rural site ethanol distillation/dehydration systems
- Development of value-added bagasse options (feed & fuel)
- Development of value-added vinasse disposition options
- Identification of *off-season* feedstock and/or processing options

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BioDimensions 2009 Sweet Sorghum Trials

- Location: Cedar Chapel cotton gin site, Whiteville, TN
- Supported by eight major collaborators (in-kind contributions)
- 18 total trial days: *September 22 – December 4*
  - 12 trial days collecting full yield and extraction mass balance data
- Harvested **13 acres** from 2 dryland fields
  - 2 varieties (M81-E & Keller); billets and forage-chopped
- Crushed **48 tons** cane
  - Recovered **20 tons** juice & **16 tons** bagasse
- Fermented **30,000 lbs** juice in 14 batches
- Conducted feed & pelleting trials with bagasse

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2009 Harvesting & Crushing

Case New Holland prototype sweet sorghum harvester – cutting 6" polished billets

Harvester provided courtesy of Case New Holland

Fulton 18" x 30" 4-Roll Mill

Mill provided courtesy of Fulton Iron & Manufacturing LLC

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2009 Trial Key Observations/Conclusions

- Crop yields: 20.8-40.1 tons/acre; lodging is an issue
- Prototype harvester and 4-Roll mill performed excellently
- Full material balance & extraction yields at commercial scale
- Billeted cane preferred for handling and roll mill crushing
  - Less pulp & fines; higher extraction ratio
  - Billet sugar is stable for 24-48 hours
- Must “macerate” bagasse for effective second crush
- Bagasse is easily pelletized without binders

2009 Results presented at SSEA Annual Conference, Orlando, January 2009

SSEA Sweet Sorghum Ethanol Association

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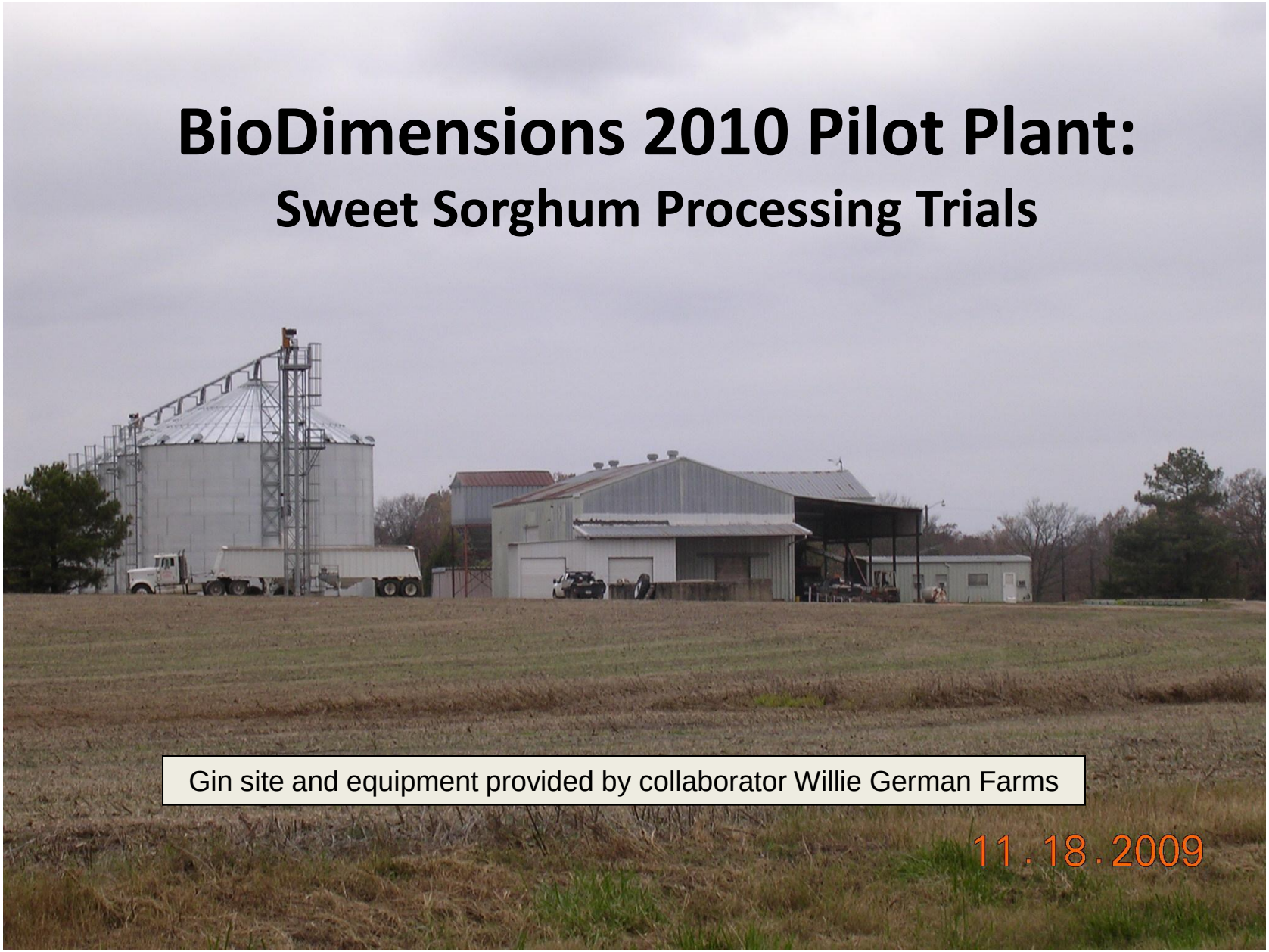
BioDimensions 2010 Pilot Plant:

Sweet Sorghum Processing Trials



Gin site and equipment provided by collaborator Willie German Farms

2010 Pilot Plant Collaborators

BioDimensions

GERMAN FARMS
Somerville, TN

MEMPHIS BIO WORKS AGBIO

CNH
Case New Holland

Mid-South Community College

MANUFACTURERA DE IMPLEMENTOS

PROTANK
liquidhandling products

AmeriFuels Energy Solutions
AE 8.1 LITER
ALTERNATIVE ENERGY SYSTEM

Rawhide Feed Mill
Whiteville, Tennessee

Pilot Plant supported by a grant from the United Sorghum Checkoff Program:

USCP
UNITED SORGHUM CHECKOFF PROGRAM

2010 Sweet Sorghum Pilot Plant Scope

- Harvesting trials – 160 acres; M81-E/9 experimental varieties
  -Collaborator **Case New Holland** will provide billet & forage harvesters
- Extraction trials – 8 hrs/day x 5 days/wk (16 wks)
  -Sugar cane roll press provided by Mexican collaborator
- Juice and syrup sales
  -Offtake agreements for 556,000 gal juice (788,000 lbs sugar)
- Ethanol fermentation/distillation R&D trials
  -Modular R&D still; hydrous alcohol for industrial engine to power mill
- Bagasse bulk feed & pellets for feeding trials
  -2000 wet tons to be processed by collaborator **Rawhide Feed**
- CAPEX $150K; expect to break-even on operating cost

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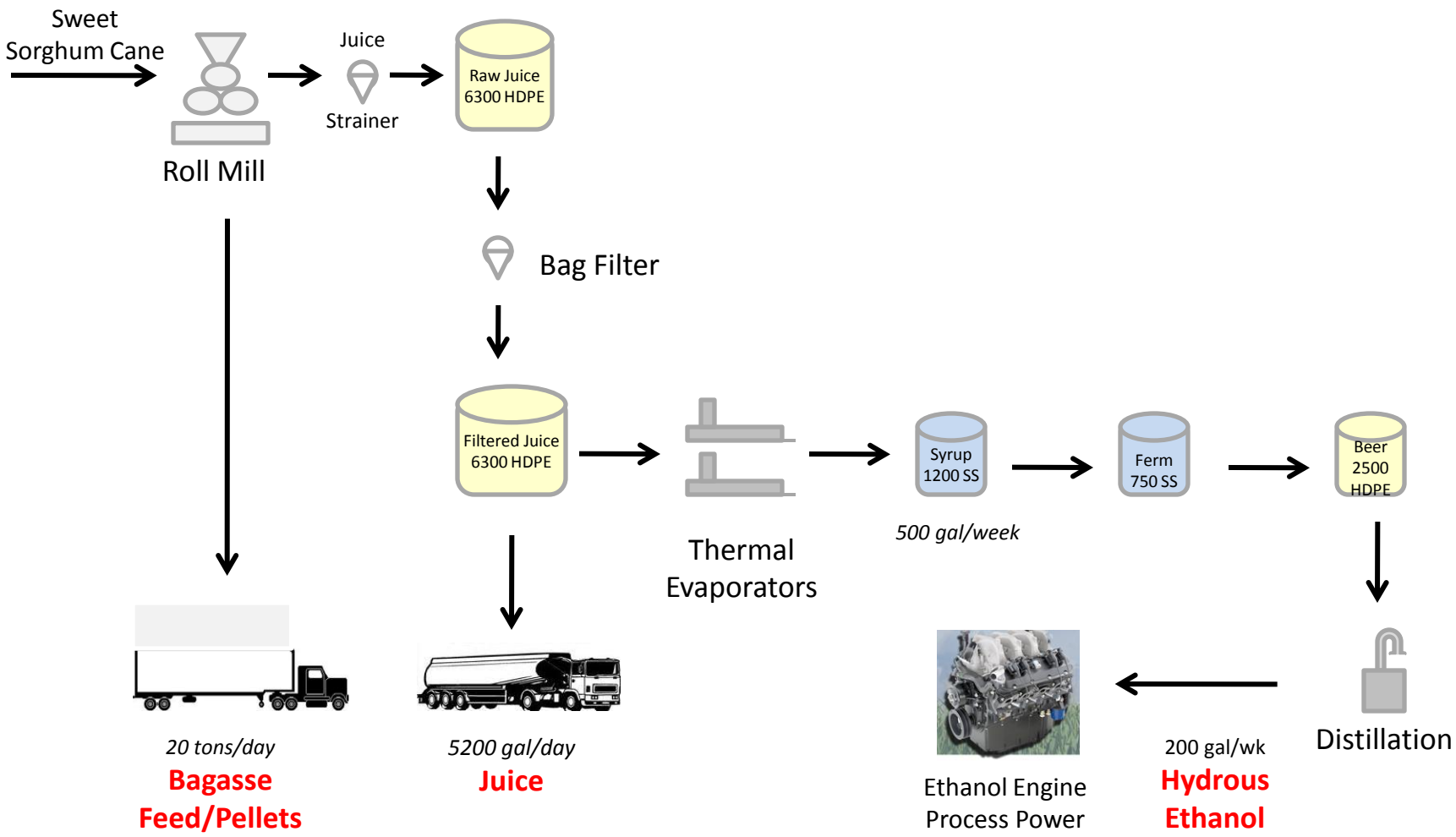
2010 Sweet Sorghum Pilot Plant PFD



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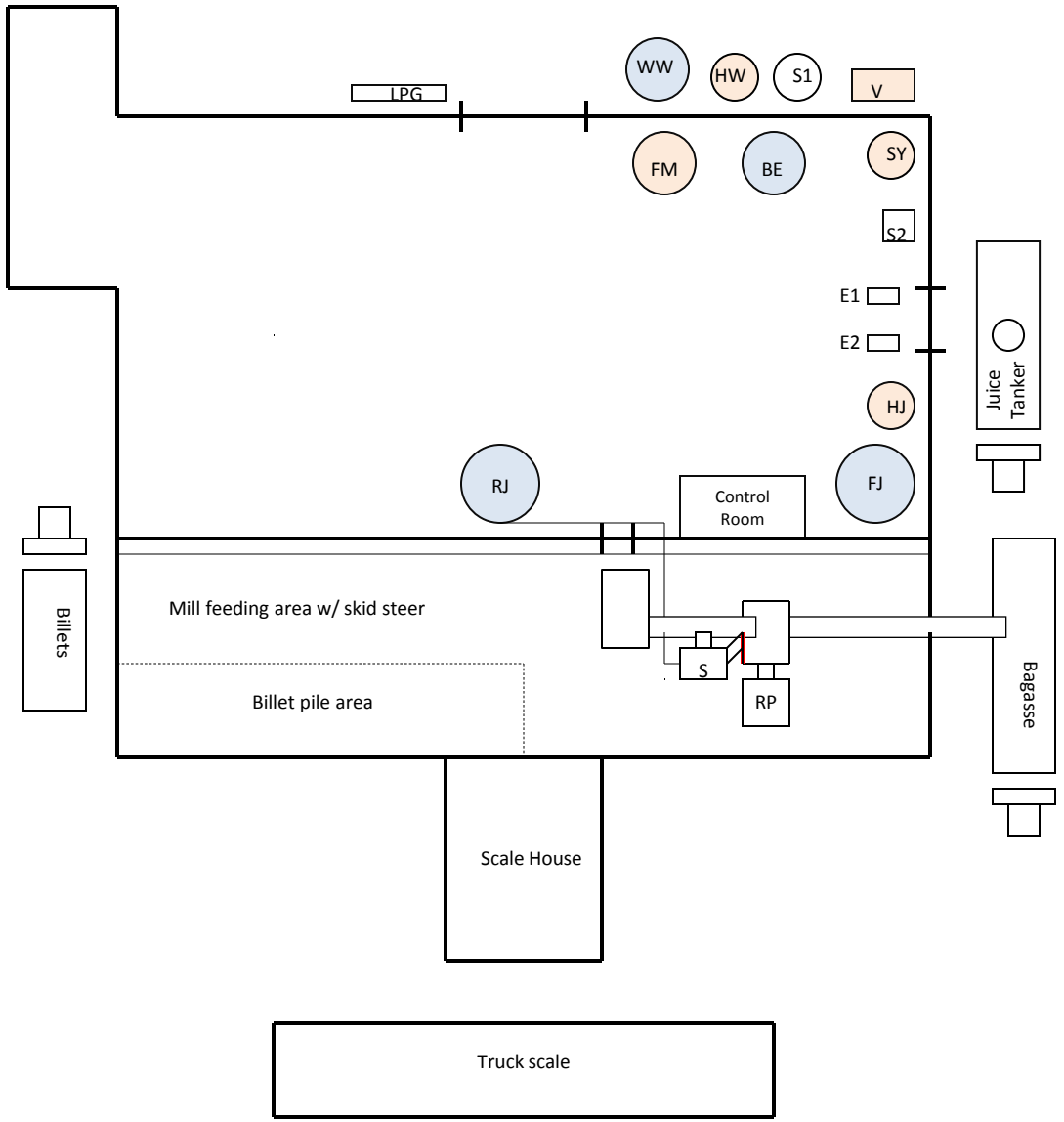
2010 Sweet Sorghum Pilot Plant Layout



Equipment Legend

BE – 2500 gal. beer tank (HDPE)
E1 – 85 gal. evaporator (SS)
E2 – 120 gal evaporator (SS)
FJ- 6300 gal. filtered juice tank (HDPE)
FM- 750 gal. jacketed fermenter (SS)
HJ- 900 gal. hot juice tank (SS)
HW – 850 gal. hot water tank (SS)
RJ – 6300 gal. raw juice tank (HDPE)
RP – Roll press
S- Continuous screen
S1 – 125 gal. batch still (propane)
S2 – 2 gph Allard continuous still
SY – 1200 gal. syrup tank (SS)
V- 500 gal. jacketed vinasse tank (SS)
WW- 3000 gal. warm water tank (HDPE)

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Summary

Ultimately it's all about Sustainability:

"[Consuming] substances that are easily regenerated within time frames that are accessible to the human lifetime."

"The ability to maintain the development of the quality of life while not compromising the ability of our progeny to do the same."

Paul Anastas & John Warner
Green Chemistry: Theory and Practice, 1998

"Learning to live off the sun in real time."

Rudy Baum, Editor-in-Chief
Chemical & Engineering News

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Questions?

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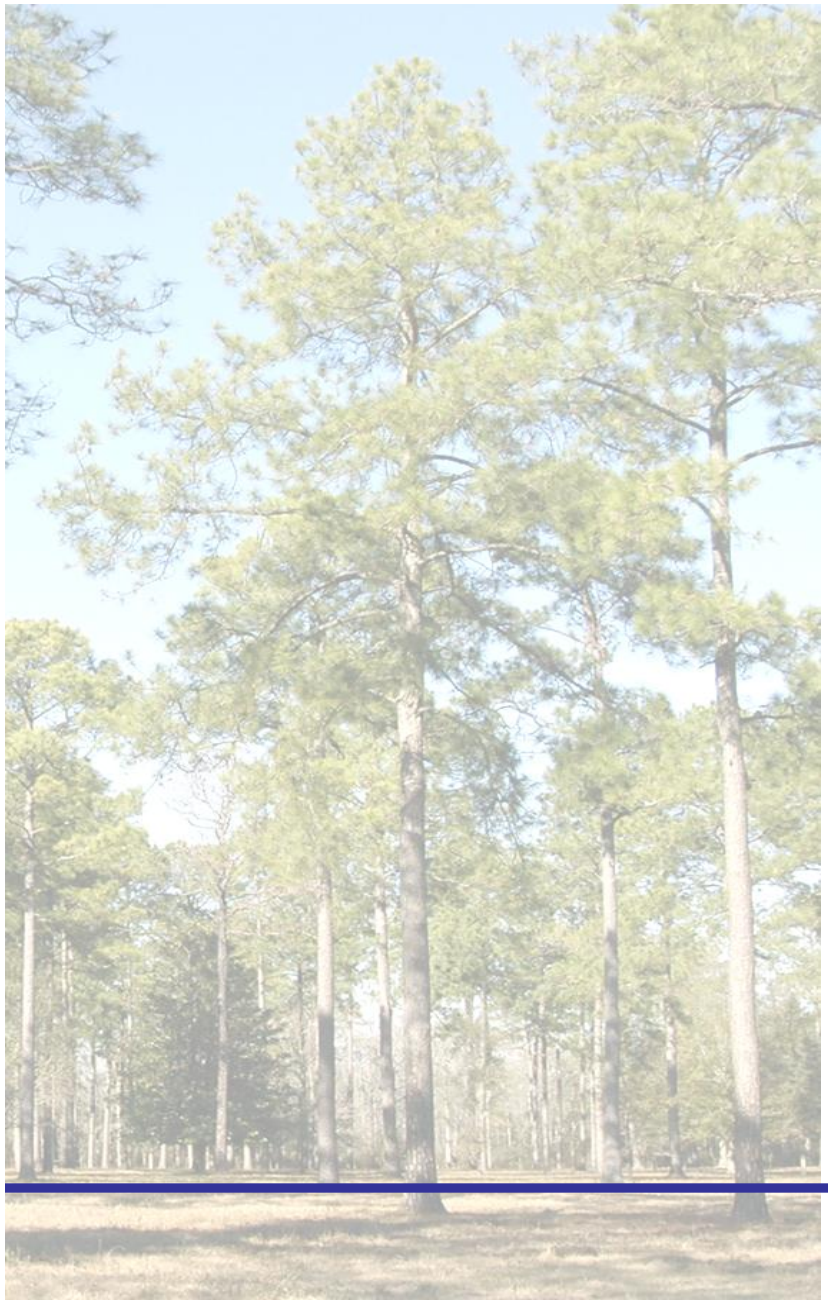
Charles Aiken

-Buckeye Technologies-



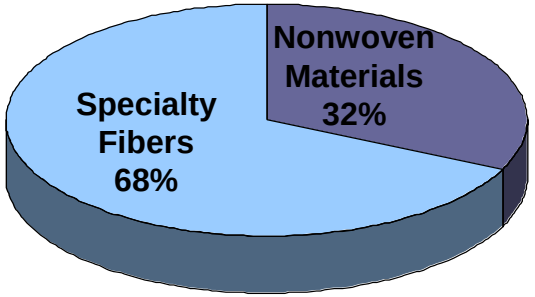
Buckeye Technologies
Sustainability and Growth

Tennessee Alternative Fuels and Bioenergy Conference

BUCKEYE

Products

- The diversity of our product mix is a strength which as helped us navigate through the current economic downturn



Nonwoven Materials	Specialty Fibers		
	Fluff Pulp	Chemical Cellulose	Customized Fibers
32%	20%	35%	13%

Wipes

Baby Diapers

Tire Cord

Ethers (Thickeners)

UltraFiber 500®

Filters

Table Top

Femcare

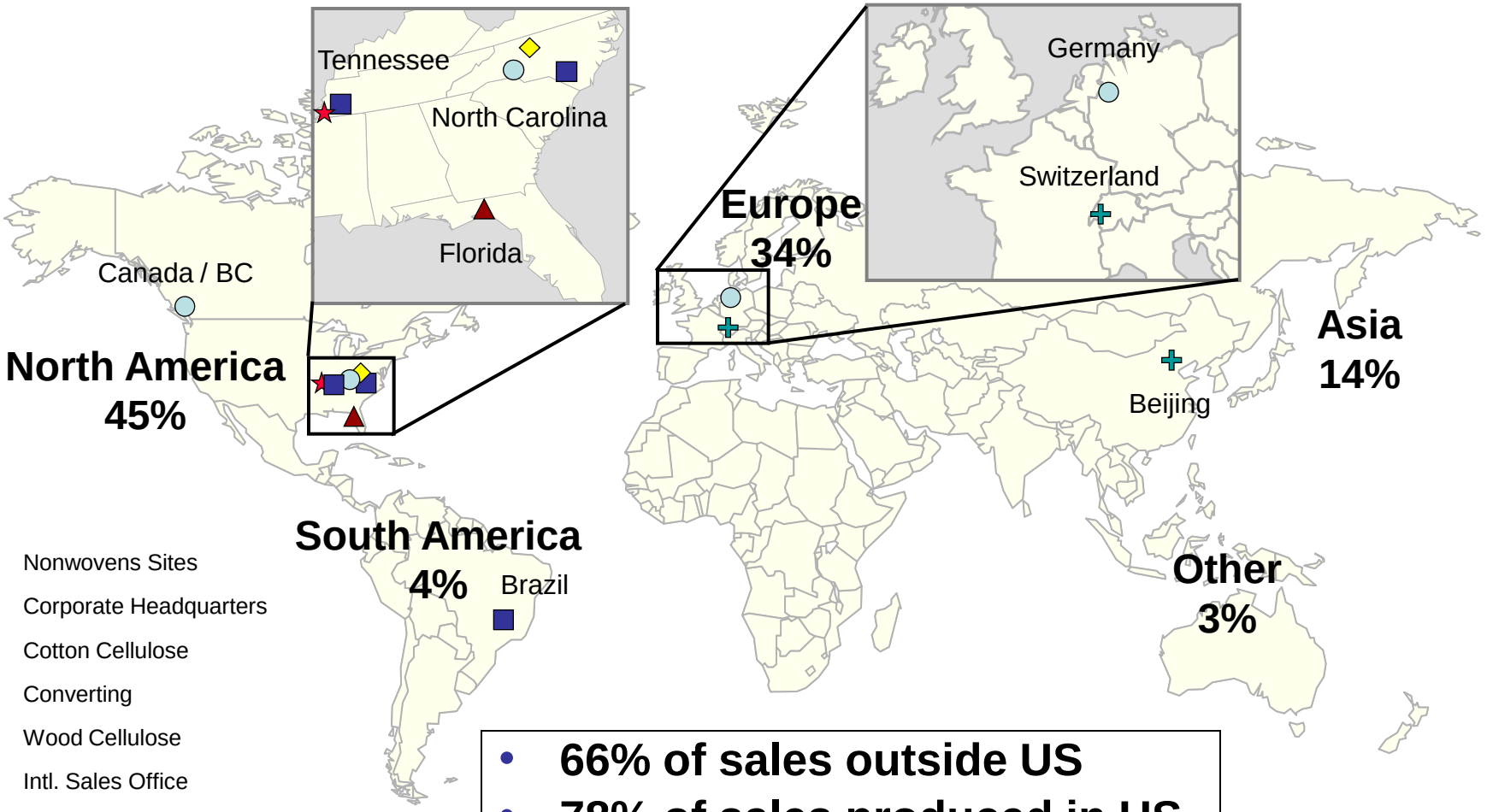
LCD Screens

Food Casings

Currency Papers

Geographic Diversity

1,444 Employees

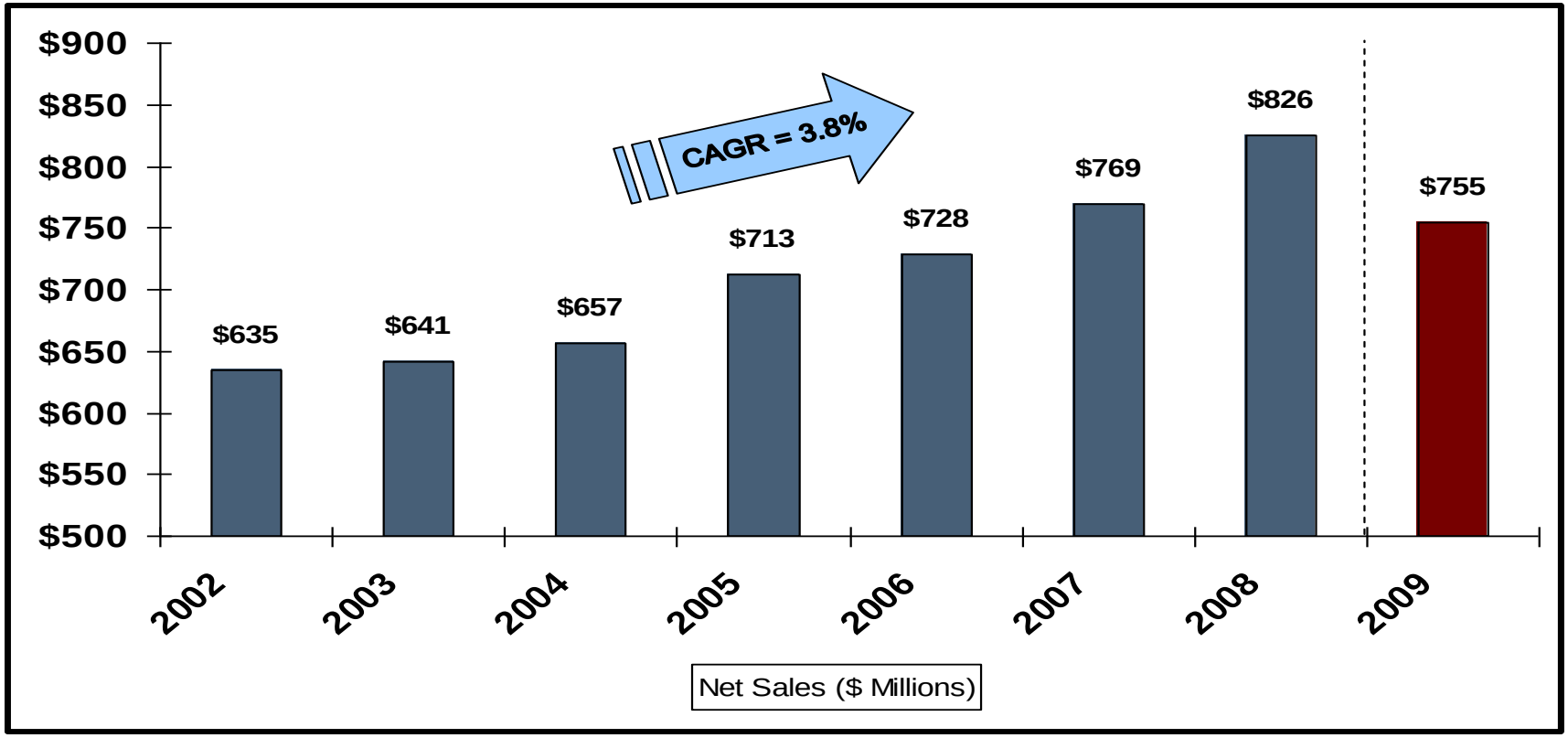


Based on fiscal 2009 Sales

- **66% of sales outside US**
- **78% of sales produced in US**

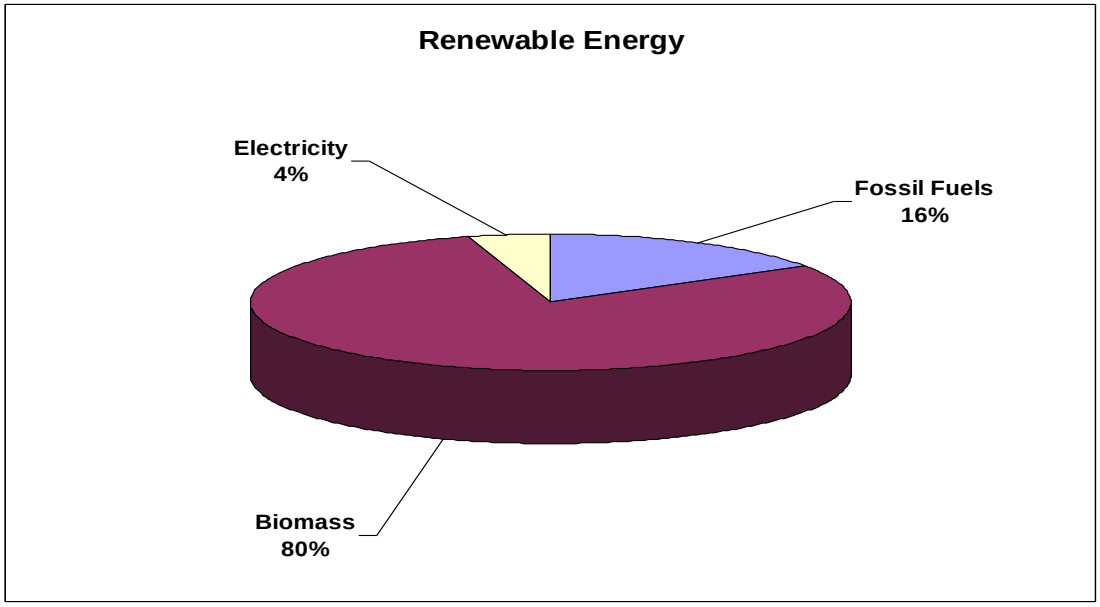
Net Sales

- Diversified product mix and reduced reliance on fluff pulp
- Grew sales 30% from 2002 to 2008 (CAGR ~ 3.8%)
- 2009 impacted by recession, but 18.9% better than 2002



Resource Utilization

- **Fossil Fuel Use – reduced by 11% since 2003**
- **Biomass supplied 80% of Buckeye's total energy requirements in 2008**



- **Water Consumption – reduced by 1.1 billion gallons since 2003**

Buckeye's Sustainability Goals

By the year 2015, we intend to:

- Reduce our fossil fuel usage by 10%
- Reduce our use of purchased electricity by 25%
- Reduce our greenhouse gas emissions from fossil fuels and purchased electricity by 15%
- Reduce water usage by 5%

(measured on a "per ton" basis, using 2007 as the baseline year)

Florida Site Energy Vision

Electrical Independence

- $45mm investment to increase renewable energy to 95%
- Save equivalent of 200,000 barrels of oil/year
- Reduce 87,500 MT of CO2e
- $7.4mm grant from State of Florida

UF Pilot Plant

- Partnership with University of Florida
- Cellulosic bio-refinery
- Input = Biomass
- Output = Ethanol/Organic Acids

Fossil Fuel Independence

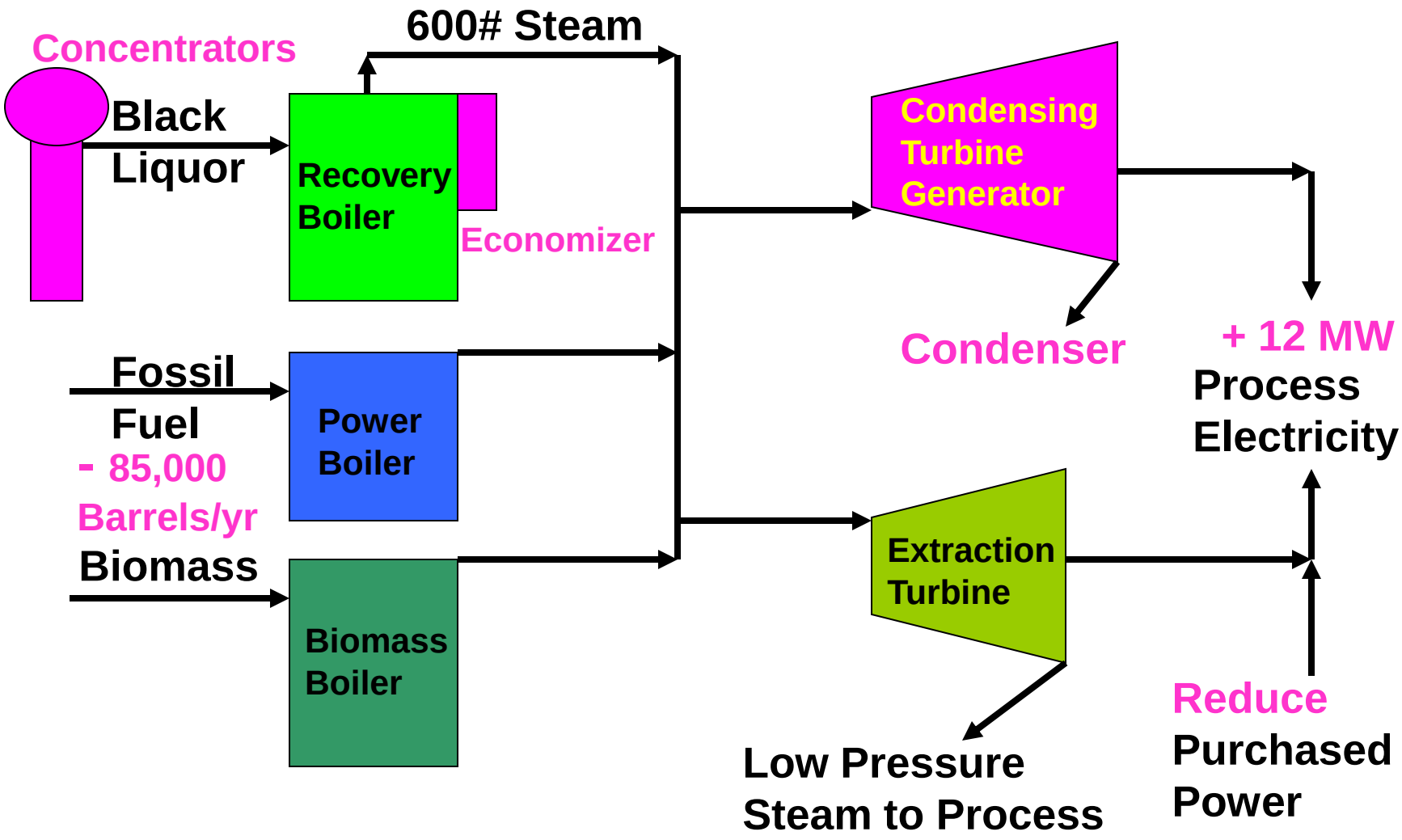
- Increase renewable energy to 100%
- Save equivalent of 250,000 barrels of oil/year
- Reduce 100,000 MT of CO2e
- Permit “green” power sales to the grid

Bio-Refinery

- Bio-fuels
- Bio-polymers
- Dependent on regulation, technology, and partnership(s)

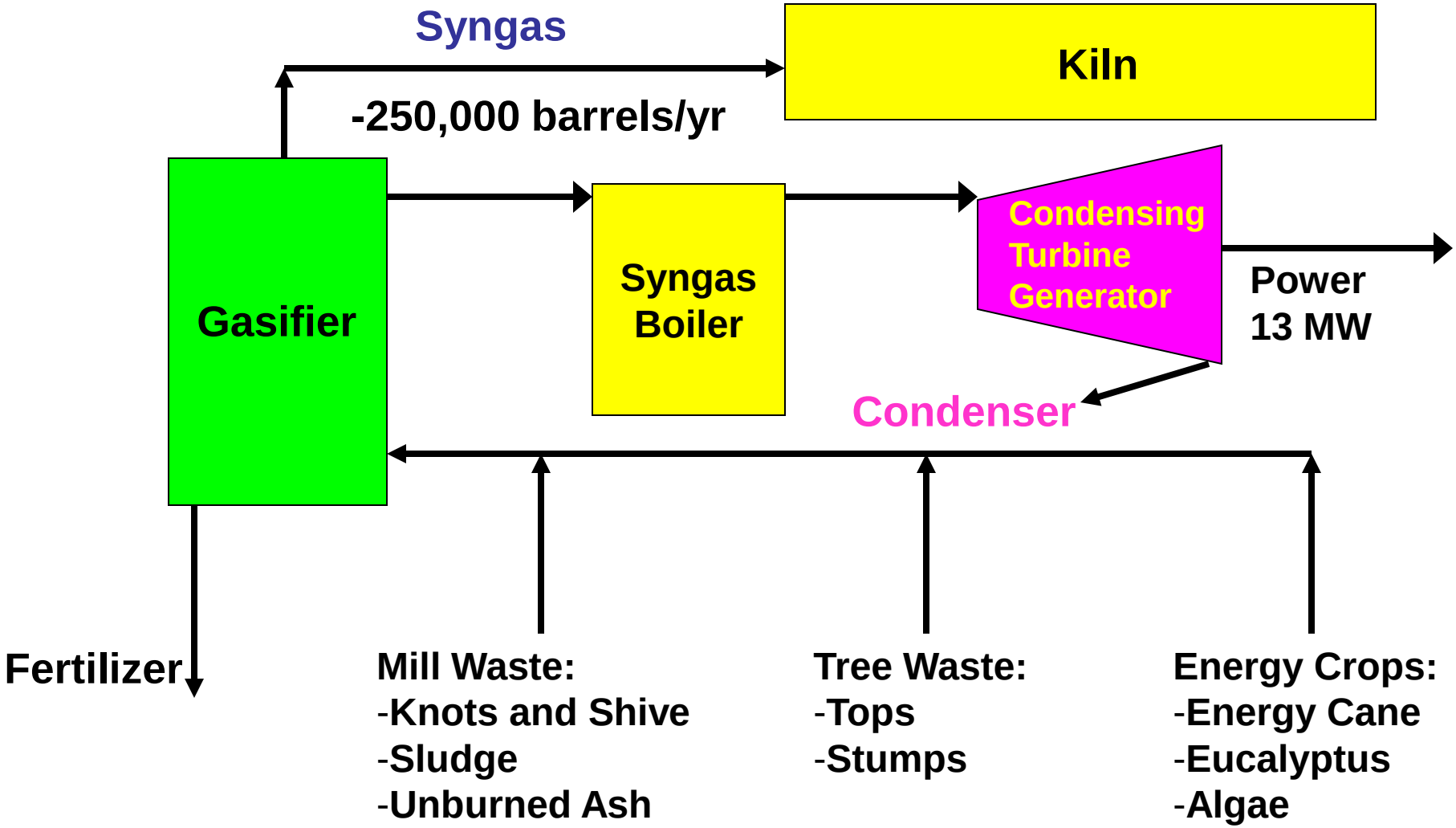
Electrical Independence

Eliminate 200,000 Barrels of Oil/Yr.



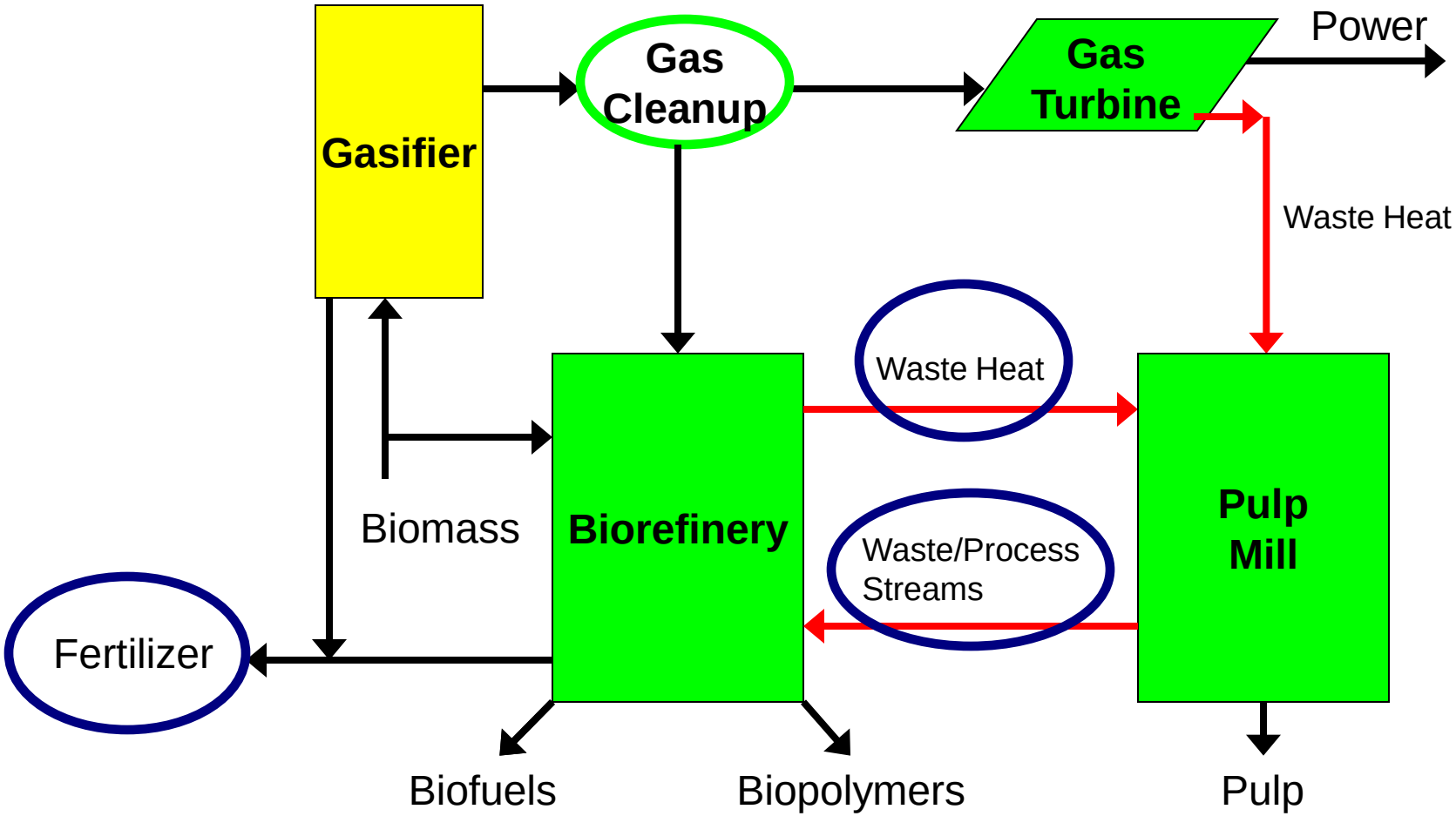
Fossil Fuel Independence

Eliminate 250,000 barrels of Oil/yr
Green Power Sold to the Grid



Biorefinery

Biofuels/Chemicals



UF PILOT PLANT – CELLULOSIC BIOREFINERY

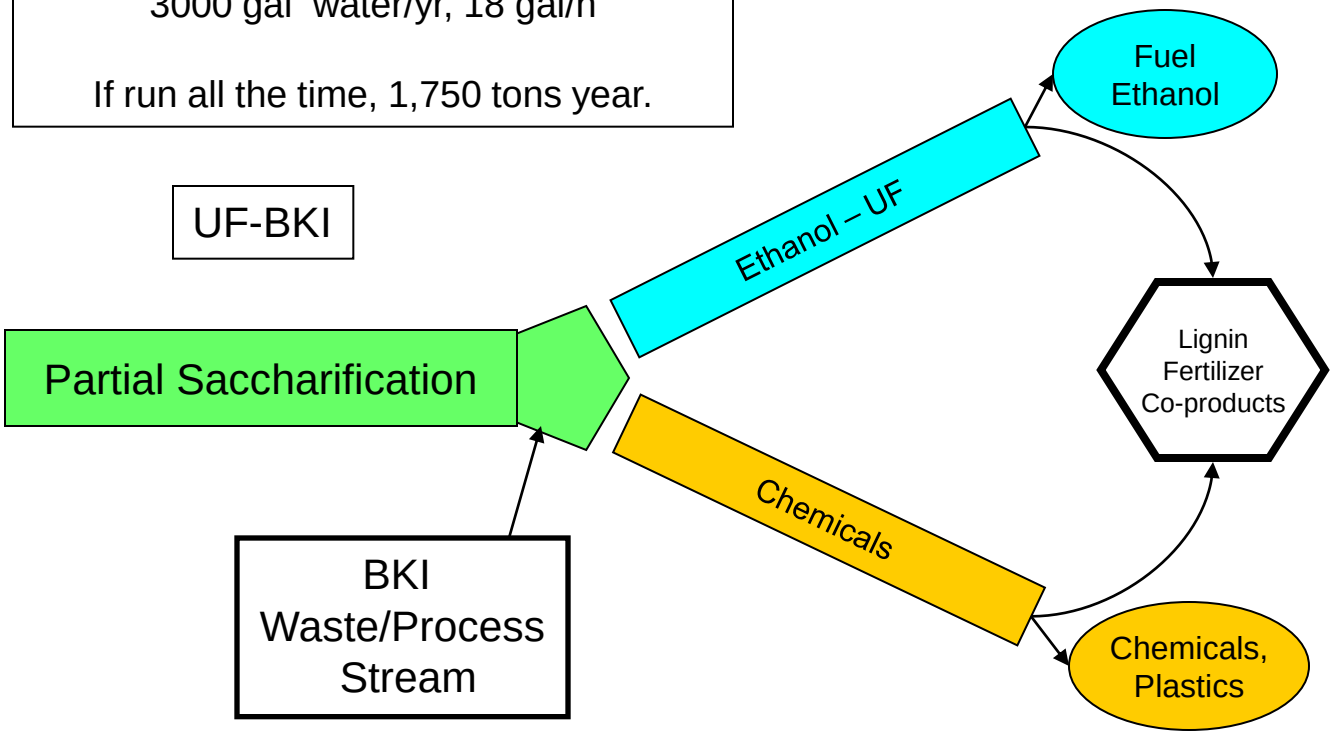
Raw Materials

- Agricultural, Forestry and Municipal Residues
- Opportunity Streams from Buckeye
- Biomass Production
- Bagasse
- Forest Understory
- Mixed Hardwood Chips

Size: 3-5 tons of cellulosic biomass/day
Estimate 600 tons per year.
3000 gal water/yr, 18 gal/h

If run all the time, 1,750 tons year.

UF-BKI



→ 200 gal ethanol/day (70,000 gal/yr)

UF UNIVERSITY of FLORIDA IFAS

Cottonwood

Energy Cane

Eucalyptus

WHAT DOES BUCKEYE OFFER?

BUCKEYE

- Demonstrated commitment to sustainability
- Positive vision of the future
- Resources and Assets
    - Knowledge - Cellulose chemistry expertise
    - Biomass boilers and turbine generators
        - “Green” power to sell
    - Carbon credits, renewable energy credits
- Access to biomass – relationships with suppliers
- Water and wastewater treatment
- Willingness to partner

BUCKEYE

QUESTIONS

BUCKEYE